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NASIONALE SENIOR CERTIFIKAAT-EKSAMEN
NOVEMBER 2020

TEGNIESE WISKUNDE: VRAESTEL II
NASIENRIGLYNE

Tyd: 3 uur

150 punte

Hierdie nasienriglyne is opgestel vir gebruik deur eksaminators en hulpeksaminators van wie verwag word om almal 'n standaardiseringsvergadering by te woon om te verseker dat die riglyne konsekwent vertolk en toegepas word by die nasien van kandidate se skrifte.

Die IEB sal geen bespreking of korrespondensie oor enige nasienriglyne voer nie. Ons erken dat daar verskillende standpunte oor sommige aangeleenthede van beklemtoning of detail in die riglyne kan wees. Ons erken ook dat daar sonder die voordeel van die bywoning van 'n standaardiseringsvergadering verskillende vertolkings van die toepassing van die nasienriglyne kan wees.

VRAAG 1

$$1.1 \quad m_{AB} = \frac{y_B - y_A}{x_B - x_A}$$

$$m_{AB} = \frac{17-5}{12-3} = \frac{4}{3} \quad \text{vervang in korrekte formule}$$

vereenvoudiging

$$1.2 \quad m_{AB} \times m_{BC} = -1$$

$$\frac{4}{3} \times m_{BC} = -1$$

$$m_{BC} = \frac{-3}{4} \quad \text{vereenvoudiging}$$

$$m_{BC} = \frac{y_B - y_C}{x_B - x_C} = \frac{-3}{4}$$

$$\frac{17-20}{12-k} = \frac{-3}{4} \quad \text{vervang in korrekte formule}$$

$$4(17-20) = -3(12-k) \quad \text{vereenvoudig}$$

$$-12 = -3(12-k)$$

$$4 = 12 - k$$

$$k = 8 \quad \text{vereenvoudiging}$$

$$1.3 \quad AB = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$$

$$= \sqrt{(12-3)^2 + (17-5)^2} \quad \text{vervang in korrekte formule}$$

$$= \sqrt{225}$$

$$= 15 \text{ eenhede antwoord}$$

$$AB^2 + BC^2 = AC^2 \quad (\text{Pythagoras})$$

$$(15)^2 + (5)^2 = AC^2 \quad \text{vervang in korrekte formule}$$

$$AC^2 = 250$$

$$AC = 5\sqrt{10} \quad \text{vereenvoudiging}$$

$$\text{Omtrek} = 15 + 5 + 5\sqrt{10} = 20 + 5\sqrt{10} \quad \text{antwoord}$$

VRAAG 2

2.1 2.1.1 $r^2 = x^2 + y^2$

$$r^2 = 8^2 + 4^2$$

$$r^2 = 80$$

$$\therefore x^2 + y^2 = 80$$

2.1.2 $A(-8; -4)$

2.1.3 $A(-8; -4)$ $B(8; 4)$

$$m_{AB} = \frac{y_A - y_B}{x_A - x_B} = \frac{-4 - 4}{-8 - 8} = \frac{1}{2}$$

$$\therefore y = \frac{1}{2}x$$

2.1.4 $m_{PT} \times m_{AQ} = -1$ (raaklyn $\perp$ radius)

$$\therefore m_{PT} = -2$$

$$\tan \theta = -2$$

$$\theta = 180^\circ - 63,43^\circ = 116,57^\circ$$

2.1.5 $y = -2x + c$ **OF**

$$-4 = -2(-8) + c$$

$$c = -20$$

$$\therefore y = -2x - 20$$

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

$$y + 4 = -2(x - 8)$$

$$y = -2x - 20$$

2.1.6 $y = -2x + -20$

$$-10 = -2t + -20$$

$$t = -5$$

OF

$$m(AT) = -2$$

$$\frac{-4 + 10}{-8 - t} = -2$$

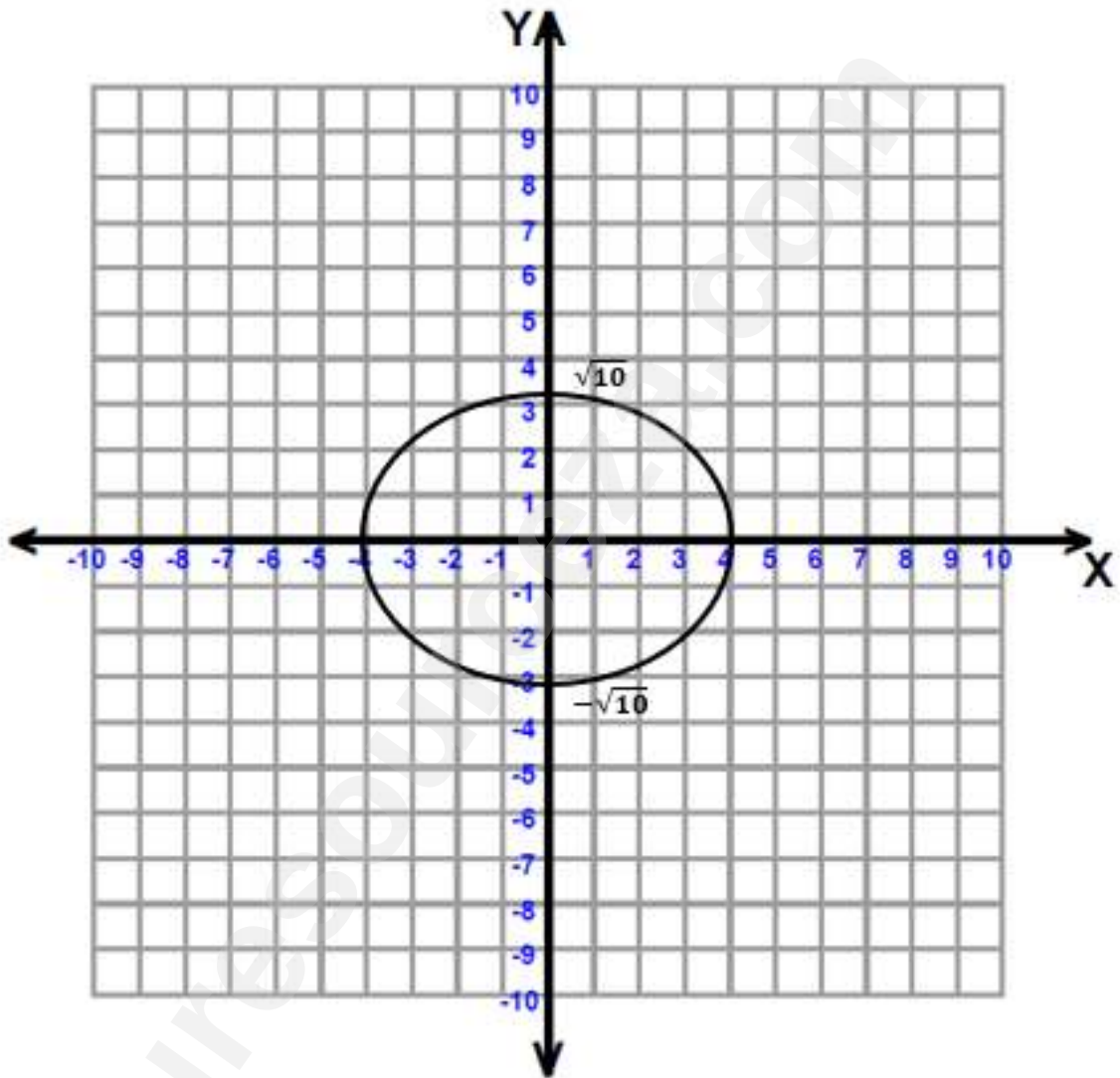
$$16 + 2t = 6$$

$$2t = -10$$

$$t = -5$$

2.2 Skets die grafiek gedefinieer deur $\frac{x^2}{16} + \frac{y^2}{10} = 1$.

Toon AL die afsnitte met die asse duidelik.



x-afsnitte by 4 en -4

y-afsnitte by $\sqrt{10}$ en $-\sqrt{10}$

vorm

VRAAG 3

$$\begin{aligned}
 3.1 \quad 3.1.1 \quad &= 6\left(\frac{4}{2\sqrt{13}}\right) - 3\left(\frac{4}{6}\right) \\
 &= \frac{-26 + 12\sqrt{13}}{13}
 \end{aligned}$$

$$x^2 + y^2 = r^2$$

$$6^2 + 4^2 = AO^2$$

$$52 = AO^2$$

$$\therefore AO = 2\sqrt{13}$$

$$\begin{aligned}
 3.1.2 \quad &= \left(\frac{2\sqrt{13}}{4}\right)^2 \\
 &= \frac{13}{16}
 \end{aligned}$$

$$\begin{aligned}
 3.2 \quad 3.2.1 \quad &= \operatorname{cosec}\left(\frac{\pi}{3} - \frac{\pi}{6}\right) \\
 &= \operatorname{cosec}\left(\frac{\pi}{6}\right) \\
 &= \frac{1}{\sin\left(\frac{\pi}{6}\right)} \\
 &= 2
 \end{aligned}$$

$$\begin{aligned}
 3.2.2 \quad &= 2 \cot\left(\frac{\pi}{6}\right) \\
 &= \frac{2}{\tan \frac{\pi}{6}} \\
 &= \frac{2}{\frac{1}{\sqrt{3}}} \\
 &= 2\sqrt{3} \quad \text{OF} \quad \approx 3,5
 \end{aligned}$$

$$3.3 \quad 3.3.1 \quad 124,66^\circ \times \frac{\pi}{180^\circ} \approx 2,18 \text{ radiale}$$

$$57,46^\circ \times \frac{\pi}{180^\circ} \approx 1 \text{ radiaal}$$

$$3.3.2 \quad \sec(2,18+1)$$

$$= \sec(3,18)$$

$$= \frac{1}{\cos(3,18)}$$

$$\approx -1,0$$

$$3.4 \quad \tan(180^\circ - \alpha) \cdot \cos \alpha \cdot \sin(180^\circ + \alpha) + \cos^2(360^\circ + \alpha)$$

$$= (-\tan \alpha) (\cos \alpha) (-\sin \alpha) + \cos^2 \alpha$$

$$= (-\sin \alpha)(-\sin \alpha) + \cos^2 \alpha$$

$$= \sin^2 \alpha + \cos^2 \alpha$$

$$= 1$$

$$3.5 \quad \tan(x - 15^\circ) = -1$$

$$\therefore (x - 15^\circ) = 180^\circ - 45^\circ \quad [\text{verwysingshoek } (x - 15^\circ)]$$

$$\therefore x = 150^\circ$$

$$3.6 \quad \text{LK: } \sin^2 A + \tan^2 A + \cos^2 A \quad \text{RK: } \sec^2 A$$

$$= 1 + \tan^2 A$$

$$= \sec^2 A$$

$$= \text{RK}$$

$$3.7 \quad 3.7.1 \quad a = 3; b = 1; c = 0; d = 2$$

$$3.7.2 \quad \text{Periodisiteit} = \frac{360^\circ}{3}$$

$$\text{Periodisiteit} = 120^\circ$$

VRAAG 4

$$4.1 \quad 4.1.1 \quad \frac{30\text{m}}{\sin 65^\circ} = \frac{AB}{\sin 50^\circ}$$

$$\frac{30\sin 50^\circ}{\sin 65^\circ} = AB$$

$$AB \approx 25,36 \text{ m}$$

$$4.1.2 \quad \cos 25^\circ = \frac{AD}{AB}$$

$$\cos 25^\circ = \frac{AD}{25,36\text{m}}$$

$$25,36 \times \cos 25^\circ = AD$$

$$AD \approx 22,98 \text{ m}$$

$$\frac{AD}{\sin 65^\circ} = \frac{25,36}{\sin 90^\circ}$$

$$\text{OF} \quad AD = \frac{25,36 \times \sin 65^\circ}{\sin 90^\circ}$$

$$AD \approx 22,98 \text{ m}$$

$$4.2 \quad 4.2.1 \quad AC^2 = AB^2 + CB^2 - 2AB.CB.\cos 60^\circ$$

$$AC^2 = (680 \text{ m})^2 + (420 \text{ m})^2 - 2(680 \text{ m})(420 \text{ m})\cos 60^\circ$$

$$AC^2 = 353200$$

$$AC \approx 594 \text{ m}$$

$$4.2.2 \quad 120^\circ$$

$$4.2.3 \quad \frac{AD}{\sin 41^\circ} = \frac{594 \text{ m}}{\sin 120^\circ}$$

$$\therefore AD = \frac{594 \times \sin 41^\circ}{\sin 120^\circ}$$

$$AD \approx 450 \text{ m}$$

VRAAG 5

5.1 In $\triangle ABC$: $AC^2 = AB^2 + BC^2$ (Pythagoras)

$$AC^2 = (230)^2 + (230)^2$$

$$AC = 230\sqrt{2} \quad \text{OF} \quad \therefore AC = 325,269\dots$$

$$\therefore MC = \frac{230\sqrt{2}}{2} \quad \text{OF} \quad \therefore MC = \frac{325,269}{2}$$

$$\therefore MC = 115\sqrt{2} \quad \text{OF} \quad \therefore MC = 162,63$$

5.2 $\cos \hat{MCT} = \frac{MC}{TC}$

$$\cos \hat{MCT} = \frac{115\sqrt{2} \text{ m}}{218 \text{ m}}$$

$$\therefore \cos \hat{MCT} = 0,746$$

$$\therefore \hat{MCT} \approx 41,75^\circ$$

VRAAG 6

- 6.1 6.1.1 $\hat{H}_1 = \hat{F}_1 = 23^\circ$ (hoeke in dieselfde segment)
 $\hat{F}_1 + \hat{F}_2 = \hat{E}_3 = 50^\circ$ (gelyke hoeke teenoor gelyke sye; radii)
 $\therefore 23^\circ + a = 50^\circ$
 $a = 27^\circ$
- 6.1.2 $\hat{E}_1 = \hat{F}_2 + \hat{F}_3$ (hoeke in dieselfde segment)
 $49^\circ = 27^\circ + b$
 $22^\circ = b$
- 6.2 6.2.1 $\hat{B}_2 + \hat{F} = 180^\circ$ (teenoorstaande hoeke van koordevierhoek)
 $\hat{B}_2 + 35^\circ = 180^\circ$
 $\therefore \hat{B}_2 = 145^\circ$
- 6.2.2 $\hat{E}_1 = 2 \times \hat{F}$ (hoek by middelpunt = $2 \times$ hoek by omtrek)
 $\hat{E}_1 = 2 \times 35^\circ = 70^\circ$
- 6.2.3 $\hat{E}_1 + \hat{C}_3 + \hat{D}_2 = 180^\circ$ (binnehoeke van driehoek CED)
 $70^\circ + \hat{C}_3 + \hat{D}_2 = 180^\circ$
 $\hat{C}_3 = \hat{D}_2$ (gelyke hoeke by gelyke sye; radii)
 $\therefore \hat{C}_3 = \hat{D}_2 = 55^\circ$
- 6.2.4 $2 \hat{A} = \hat{B}_2$ (hoek by middelpunt = $2 \times$ hoek by omtrek)
 $2 \hat{A} = 145^\circ$
 $\therefore \hat{A} = 72,5^\circ$
- 6.2.5 $\hat{A} = \hat{C}_1 = 72,5^\circ$ (gelyke hoeke by gelyke sye; radii)
 $\hat{C}_1 + \hat{C}_2 = 90^\circ$ (hoek in halfsirkel)
 $\therefore \hat{C}_2 = 17,5^\circ$

6.3 6.3.1 $\hat{A}_1 = \hat{C}_1$ (hoeke teenoor gelyke sye, gegee $AD = DC$)

$$\therefore \hat{A}_1 = 37,2^\circ$$

6.3.2 $\hat{A}_1 = \hat{C}$ (hoeke teenoor gelyke sye, gegee $AD = DC$)

$$\hat{A}_1 = \hat{B}_1 = 37,2^\circ \quad (\text{raaklyn-koord-stelling})$$

$$\hat{B}_2 = 90^\circ - 37,2^\circ \quad (\text{hoek in halfsirkel})$$

$$\therefore \hat{B}_2 = 52,8^\circ$$

6.3.3 $\hat{ABE} = 90^\circ$ (hoek in halfsirkel)

$$AE^2 = BE^2 + AB^2 \quad (\text{Pythagoras})$$

$$(13)^2 = (3,5)^2 + AB^2$$

$$\therefore AB = 12,52 \text{ cm}$$

6.4 6.4.1 $\frac{PB}{BR} = \frac{PC}{CA} = \frac{1}{2}$ (Eweredigheidstelling, $CB \parallel AR$)

$$\frac{PA}{PQ} = \frac{PC + CA}{PC + CA + AQ}$$

$$\frac{3}{8} = \frac{1 + 2}{1 + 2 + 5}$$

$$\therefore \frac{BD}{BQ} = \frac{CA}{CQ}$$

$$= \frac{2}{5}$$

6.4.2 $\frac{\text{Oppervlakte van } \Delta PRA}{\text{Oppervlakte van } \Delta QRA}$

$$= \frac{0,5 \times PA \times \text{hoogte}}{0,5 \times QA \times \text{hoogte}}$$
$$= \frac{PA}{QA}$$
$$= \frac{3}{5}$$

VRAAG 7

$$7.1 \quad \text{Oppervlakte van sektor} = \frac{rs}{2} = \frac{r^2\theta}{2},$$

r = radius, s = booglengte en θ = middelpunthoek in radiale

$$\text{Oppervlakte} = \frac{(9 \text{ cm})^2 \left(80^\circ \times \frac{\pi}{180^\circ} \right)}{2}$$

$$\text{Area} = 18\pi \text{ cm}^2$$

$$\text{Oppervlakte van driehoek AOC} = \frac{1}{2} \times AO \times OC \times \sin 80^\circ$$

$$\therefore \text{Oppervlakte} = \frac{1}{2} \times 9 \text{ cm} \times 9 \text{ cm} \times \sin 80^\circ$$

$$\therefore \text{Oppervlakte} = 39,884714 \text{ cm}^2$$

$$\begin{aligned} \text{Oppervlakte van gearseerde segment} &= 18\pi \text{ cm}^2 - 39,884714 \text{ cm}^2 \\ &\approx 16,7 \text{ cm}^2 \end{aligned}$$

$$7.2 \quad 7.2.1 \quad v = \pi Dn$$

$$v = \pi(0,15)(4,2)$$

$$v = 1,98 \text{ m/s}$$

$$7.2.2 \quad \omega = 2\pi n$$

$$\omega = 2\pi(4,2)$$

$$\omega = 8,4\pi \text{ rad/s}$$

$$7.2.3 \quad (a) \quad s_1 = r\theta$$

$$s_1 = (7,5) \left(160^\circ \times \frac{\pi}{180^\circ} \right)$$

$$s_1 \approx 21 \text{ cm}$$

$$(b) \quad s_2 = r\theta$$

$$s_2 = (15) \left(200^\circ \times \frac{\pi}{180^\circ} \right)$$

$$s_2 \approx 52,4 \text{ cm}$$

$$(c) \quad (52,5)^2 = (7,5)^2 + AB^2$$

$$CD = AB \approx 52 \text{ cm}$$

$$\begin{aligned} \text{Totale lengte} &= (51,96 + 51,96 + 20,94 + 52,36) \text{ cm} \\ &\approx 177,3 \text{ cm} \end{aligned}$$

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VRAAG 8

8.1 Hemisfeer: $Volume = \frac{4}{3} \pi r^3 \div 2$

$$Volume = \frac{4}{3} \pi (20)^3 \div 2$$

$$= 16\,755,16 \text{ m}^3$$

$$\text{Silinder Volume} = \pi r^2 \times h$$

$$= \pi (20)^2 \times 8$$

$$= 10\,053,1 \text{ m}^3$$

$$\text{Volume in een tenk} = 16\,755,16 \text{ m}^3 + 10\,053,1 \text{ m}^3$$

$$= 26\,808,26 \text{ m}^3$$

$$\text{Totale volume brandstof wat tenker in die 4 tenks kan vervoer} = 4(26\,808,26 \text{ m}^3)$$

$$= 107\,233,04 \text{ m}^3$$

8.2 8.2.1 $a = 120 \text{ m} \div 6 = 20 \text{ m}$

$$\text{Oppervlakte} = a(m_1 + m_2 + m_3 + m_4 + m_5)$$

$$= 20 \left(\frac{12+15}{2} + \frac{15+16}{2} + \frac{16+17}{2} + \frac{17+17}{2} + \frac{17+16}{2} + \frac{16+12}{2} \right)$$

$$= 20(13,5 + 15,5 + 16,5 + 17 + 16,5 + 14)$$

$$= 1860 \text{ m}^2$$

8.2.2 $Volume = 1\,860 \text{ m}^2 \times 210 \text{ m}$

$$= 390\,600 \text{ m}^3$$

8.2.3 $Volume \text{ vir } 1 \text{ m diep} = 120 \text{ m} \times 210 \text{ m} \times 1 \text{ m}$

$$= 25\,200 \text{ m}^3$$

$$1 \text{ m}^3 = 1\,000 \text{ liter}$$

$$25\,200 \text{ m}^3 = 25\,200\,000 \text{ liter}$$

Totaal: 150 punte