



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NASIONALE  
SENIOR SERTIFIKAAT**

**GRAAD 11**

**TEGNIESE WISKUNDE V2**

**MODEL 2017**

**MEMORANDUM**

**PUNTE: 150**

**Hierdie memorandum bestaan uit 12 bladsye.**

**VRAAG 1**

1.1	$M_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{4 - (2)}{-6 - (2)}$ $= \frac{2}{-8} = -\frac{1}{4}$	✓ Formule ✓ Subst. ✓ Antwoord (3)
1.2	$D\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$ $D\left(\frac{-6 - 6}{2}; \frac{4 - 2}{2}\right)$ $D(-6; 1)$	✓ formule ✓ Subst. ✓ antwoord (3)
1.3	$M_{BD} = \frac{Y_2 - Y_1}{X_2 - X_1} = \frac{1}{8}$ $y = \frac{1}{8}x + c \quad (1)$ <p>subt.(2;2) in (1)</p> $2 = \left(\frac{1}{8}\right)(2) + c$ $2 = \frac{1}{4} + c$ $c = \frac{7}{4}$ $y = \frac{1}{8}x + \frac{7}{4}$	✓ grad. van BD ✓ korrekte subst. in formule  ✓ Waarde van c  ✓ Antwoord (4)
1.4	$D_{BC} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(-6 - 2)^2 + (-2 - 2)^2}$ $= \sqrt{(-8)^2 + (-4)^2}$ $= \sqrt{80}$	✓ formule ✓ subst.  ✓ antwoord (3)

1.5	$M_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-2 - 2}{-6 - 2}$ $= \frac{-4}{-8}$ $M = \frac{1}{2}$ $\tan \theta = \frac{1}{2}$ $\theta = 26,57^\circ$	✓Subst.  $\checkmark \frac{1}{2}$  ✓hoek  (3)
1.6	$\theta + 90^\circ + C = 180^\circ \quad \text{OR} \quad \hat{C} + 90^\circ = 180^\circ$ $\hat{C} = 90^\circ - 26,57^\circ \quad \hat{C} = 90^\circ - \theta$ $= 63,43^\circ \quad = 63,43^\circ$	✓✓ gebruik som van hoeke van $\Delta$ $\checkmark -26,57^\circ$ $\checkmark$ Hoek  (4)
1.7	$y = mx + c$ $y = -\frac{1}{4}x + c \dots\dots(1)$ verv.(-6;1) in (1) $1 = (-\frac{1}{4})(-6) + c \quad \text{Gradiënt van die lyn} = -\frac{1}{4}$ $1 = \frac{3}{2} + c$ $c = -\frac{1}{2}$ $y = -\frac{1}{4}x - \frac{1}{2}$	$\checkmark$ subst van $-\frac{1}{4}$  $\checkmark$ subst  $\checkmark$ waarde van c  $\checkmark$ Antwoord (4)  <b>[24]</b>

**VRAAG 2**

2.1.1	$\tan \theta = \frac{y}{x} = \frac{3}{1} = 3$ $\theta = \tan^{-1}(3)$ $\theta = 71.57^\circ$	$\checkmark \tan \theta$  $\checkmark$ antw.  (2)
2.1.2	$OP^2 = (1)^2 + (3)^2$ $OP = \sqrt{10}$	$\checkmark OP^2$  $\checkmark$ antw.  (2)
2.1.3 (a)	$\sin \theta = \frac{3}{\sqrt{10}}$	$\checkmark$ antw.  (1)
2.1.3 (b)	$\cos(180^\circ + \theta) = -\cos \theta$ $= -\frac{1}{\sqrt{10}}$ <p style="text-align: center;">Slegs antw. : Vol punte</p>	$\checkmark -\cos \theta$  $\checkmark$ antw.  (2)
2.2	$\tan(\theta - 60^\circ) = 4$ $\theta - 60^\circ = \tan^{-1}(4)$ $\theta = \tan^{-1}(4) + 60^\circ$ $\theta = 135,96^\circ$	$\checkmark \frac{1}{\tan x}$ $\checkmark \tan^{-1}$  $\checkmark$ antw.  (3)
2.3	$\frac{\cos(360^\circ - x) \cdot \sin(180^\circ - x) \cdot \tan 135^\circ}{\cos^2(180^\circ + x) \cdot \sin 240^\circ}$ $= \frac{\cos x \cdot \sin x \cdot (-\tan 45^\circ)}{\cos^2 x \cdot (-\sin 60^\circ)}$ $= \frac{\sin x \cdot (-1)}{\cos x \cdot \left(-\frac{\sqrt{3}}{2}\right)}$ $= \frac{2}{\sqrt{3}} \tan x$	$\checkmark \sin x$ $\checkmark -\sin x$ $\checkmark \tan 45^\circ$ $\checkmark \cos^2 x$ $\checkmark -\sin 60^\circ$ $\checkmark \frac{-\sin x}{-\frac{\sqrt{3}}{2} \cos x}$ $\checkmark \frac{2\sqrt{3}}{3} \tan x$  (7)

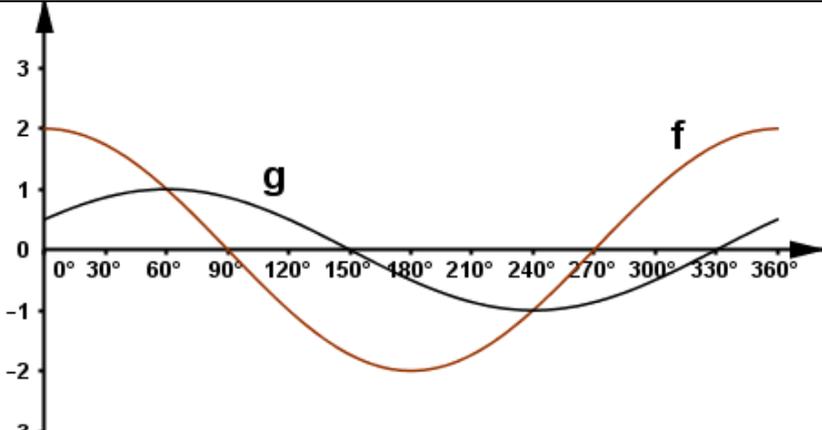
2.4	$\frac{\sin x}{1 + \cos x} + \frac{1 + \cos x}{\sin x} = \frac{2}{\sin x}$ <p><i>LHS</i></p> $\frac{\sin^2 x + (1 + \cos x)^2}{\sin x(1 + \cos x)}$ $= \frac{\sin^2 x + 1 + 2 \cos x + \cos^2 x}{\sin x(1 + \cos x)}$ $= \frac{2 + 2 \cos x}{\sin x(1 + \cos x)}$ $= \frac{2(1 + \cos x)}{\sin x(1 + \cos x)}$ $= \frac{2}{\sin x} = RHS$	✓ teller ✓ noemer ✓ uitbreiding ✓ vereenvoudiging ✓ faktorisering  (5) [22]
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**VRAAG 3**

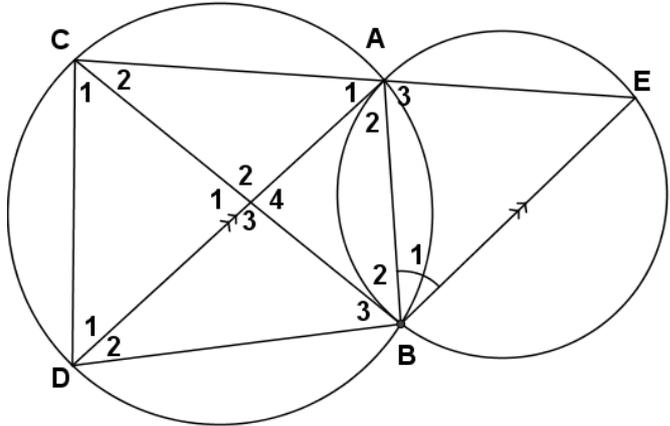
3.1	$\hat{D}EC = 40^\circ$ <i>verw. binne <math>\angle e</math> <math>AC \parallel BE</math></i>	✓ antw. (1)
3.2	$\tan 40^\circ = \frac{CD}{100}$ $\therefore CD = 100 \times \tan 40^\circ$ $CD = 83,91m$	✓ Gebruik tan en subst. ✓ isolering van CD ✓ antw. (3)
3.3	$\hat{A}EC = 40^\circ - 25^\circ$ $= 15^\circ$ <i>buite. <math>\angle</math> van <math>\Delta =</math> som van teenoorstaande binne <math>\angle e</math></i>	✓✓ antw. (2)
3.4	$\cos 40^\circ = \frac{100}{CE}$ $CE = \frac{100}{\cos 40^\circ}$ $\therefore CE = 130,54m$  Of $CE^2 = 83,91^2 + 100^2$ (Wet van Pythagoras) $= 1703,921$ $\therefore CE = 130,54m$	✓ gebruik cos en subst. ✓ antw.  ✓ subst. in Pythagoras ✓ antw. (2)

3.5	$\frac{AC}{\sin 15^\circ} = \frac{130,54}{\sin 25^\circ}$ $AC = \frac{130,54 \times \sin 15^\circ}{\sin 25^\circ}$ $\therefore AC = 79,95m$ <p style="text-align: center;">Of</p> <p>In <math>\triangle ABE</math>, <math>\hat{AEB} = 25^\circ</math> en <math>AB = 83,91</math>  As <math>BD = x</math>, dan is <math>BE = (x+100)m</math></p> $\tan 25^\circ = \frac{83,91}{x+100}$ $x+100 = \frac{83,91}{\tan 25^\circ}$ $\therefore x = BD = 79,95m$	✓ gebruik van sin reël ✓✓ subst. ✓ isolering van AC ✓ antw. OF ✓ $BE = (x+100)m$ ✓✓ $\tan 25^\circ = \frac{83,91}{x+100}$ ✓ isolering van $x$ ✓ antw. (5)
		<b>[13]</b>

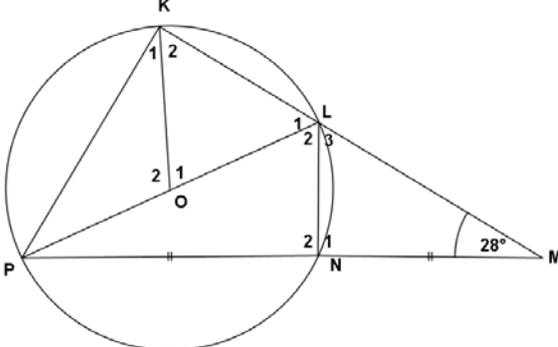
**VRAAG 4**

4.1		✓ y-afsnitte van $g$ ✓ vorm van $g$ ✓ $x$ afsnitte van $f$ ✓ $y$ afsnitte van $f$ ✓ vorm van $f$ (5)
4.2	2	✓ antw. (1)
4.3	$360^\circ$	✓ antw. (1)
4.4	$0^\circ < x \leq 60^\circ$ $180^\circ < x \leq 360^\circ$	✓ kritieke waardes ✓ notasie (2)
4.5	$60^\circ < x < 240^\circ$	✓✓ antw. Met korrekte notasie (2)
		<b>[11]</b>

**VRAAG 5**

<p>5.1</p>	 <p> <math>\widehat{C}_2 = 40^\circ</math> (raaklyn koord stelling)  <math>\widehat{D}_2 = 40^\circ</math> (raaklyn koord stelling)  <math>\widehat{A}_2 = 40^\circ</math> (verwbi <math>\sphericalangle e</math>; <math>AD \parallel BE</math>)  <math>\widehat{A}_1 = \widehat{A}_2 = 40^\circ</math> (gege <math>AD</math> halveer <math>\widehat{CAB}</math>)  <math>\widehat{B}_3 = \widehat{A}_1 = 40^\circ</math> (<math>\sphericalangle e</math> in selfde segment)  <math>\widehat{C}_1 = \widehat{A}_2 = 40^\circ</math> (<math>\sphericalangle e</math> in selfde segment)  <math>\widehat{E} = \widehat{A}_1 = 40^\circ</math> (ooreenkomstige <math>\sphericalangle e</math>; <math>AD \parallel EB</math>)         </p>	<p>             ✓ hoek              ✓ rede               (14)         </p>
<p>5.2</p>	<p> <math>180^\circ - (\widehat{E} + \widehat{B}_1) = \text{som van } \sphericalangle e \text{ van } \Delta</math>  <math>\widehat{A}_3 = 180^\circ - (40^\circ + 40^\circ)</math>  <math>= 180^\circ - 80^\circ</math>  <math>= 100^\circ</math> </p>	<p>             ✓ <math>\sphericalangle e</math> van <math>\Delta</math> is <math>180^\circ</math>               ✓ antw.               (2)         </p>
		<b>[16]</b>

## VRAAG 6

6.1	 <p>In <math>\triangle LPN</math> en <math>\triangle LMN</math></p> <p>1) <math>PN = NM</math> gegee</p> <p>2) <math>N_2 = 90^\circ</math> <math>\angle</math> In halwe sirkel  <math>\widehat{N}_1 = \widehat{N}_2</math> supl hoeke  <math>= 90^\circ</math></p> <p>3) <math>LN</math> is gemeenskaplik  <math>\Rightarrow \triangle LPN = \triangle LMN</math> (SHS)  <math>\Rightarrow \widehat{LPN} = 28^\circ</math></p>	<p>✓ gegee          ✓  <math>\angle</math> e in halwe – sirkel          ✓ <math>\angle</math> e op 'n reguitlyn</p> <p>✓ gemeenskaplike sy          ✓ SHS          ✓ Antw.</p> <p>(6)</p>
6.2	$\widehat{K}_1 + \widehat{K}_2 = 90^\circ$ $\widehat{KPM} = 180^\circ - (90^\circ + 28^\circ)$ som van $\angle$ 'e van $\Delta$ $= 180^\circ - 118^\circ$ $= 62^\circ$ $\Rightarrow \widehat{KPO} = 62^\circ - 28^\circ$ $= 34^\circ$ $\Rightarrow \widehat{KOP} = 180^\circ - (34^\circ + 34^\circ)$ som van $\angle$ 'e van $\Delta$ $= 180^\circ - 68^\circ$ $= 112^\circ$ OF $\widehat{L}_1 = 28^\circ + 28^\circ$ buite. $\angle$ = som van teenoorstaande binne. $\angle$ 'e $\widehat{KOP} = \widehat{L}_1 + \widehat{K}_2$ buite. $\angle$ = som van teenoorstaande binne. $\angle$ 'e $\widehat{KOP} = 56^\circ + 56^\circ$ $= 112^\circ$	<p>✓  <math>\angle</math> e in semi – sirkel</p> <p>✓ som van <math>\angle</math> e in <math>\Delta</math></p> <p>✓ <math>34^\circ</math></p> <p>✓ som van <math>\angle</math> e in <math>\Delta</math></p> <p>✓ antw.</p> <p>✓ ✓ stelling en rede          ✓ ✓ stelling en rede</p> <p>✓ antw.</p> <p>(5)</p>
<b>[11]</b>		

**VRAAG 7**

7.1.1	$OB = EB = x + 8$ radiale	✓ antw. (1)
7.1.2	<p>In <math>\triangle OBD</math>  <math>O\hat{D}B = 90^\circ</math> lyn van middlepunt van koord  <math>OD^2 + DB^2 = OB^2</math> Wet van pythagoras  <math>x^2 + 12^2 = (x + 8)^2</math>  <math>144 = 16x + 64</math>  <math>16x = 80 \Rightarrow x = 5</math>  <math>\therefore OB = 5 + 8 = 13\text{cm}</math></p>	<p>✓ <math>90^\circ</math>  ✓ formule  ✓ subst.   ✓ antw. (4)</p>
7.2.1	$x = 180^\circ - (68^\circ + 68^\circ)$ $= 180^\circ - 136^\circ$ $= 44^\circ$	<p>✓ ✓ <math>\angle</math> van <math>\Delta</math>  ✓ Antw. (3)</p>
7.2.2	$\hat{B}_1 = 32^\circ$ tan chord theorem $y = 180^\circ - (36^\circ + 32^\circ)$ $= 180^\circ - 68^\circ$ $= 112^\circ$	<p>✓ raaklyn koord st.  ✓ <math>\angle</math> van <math>\Delta</math>  ✓ Antw. (3)</p>
7.2.3	$\hat{E} = 68^\circ$ $BD^2 = ED^2 + BE^2 - 2ED \cdot BE \cdot \cos \hat{E}$ $= (11)^2 + (11)^2 - 2(11)(11) \cos 68^\circ$ $BD = 12,3\text{cm}$ OF $\therefore \frac{BD}{\sin \hat{E}} = \frac{EB}{\sin \hat{BDE}}$ $\therefore BD = \frac{11 \times \sin 68^\circ}{\sin 56^\circ}$ $= 12,3\text{cm}$	<p>✓ waarde van <math>\hat{E}</math>  ✓ cos reël  ✓ subst.  ✓ antw.   ✓ sin reël  ✓ waarde van <math>\hat{E}</math>  ✓ waarde van <math>\hat{BDE}</math>  ✓ antw. (4)</p>
		<b>[15]</b>

**VRAAG 8**

8.1	$\theta = 50^\circ$ , $d = 52\text{cm}$ , $r = 26\text{cm}$ $s = r\theta$ $= 26 \times 50^\circ \times \frac{\pi}{180^\circ}$ $= \frac{65}{9}\pi = 22,69\text{cm}$	✓ subst. in korrekte formule ✓ antw. (2)
8.2.1	$38\text{rev. min}^{-1} = \frac{38\text{rev}}{1 \times 60\text{s}} = 0,63\text{rev.s}^{-1}$	✓ antw. (1)
8.2.2	$n = 0,63\text{rev.s}^{-1}$ $\omega = 2\pi n$ $= 2 \times \pi \times 0,63$ $= \frac{63}{50}\pi = 3,96\text{rad.s}^{-1}$	✓ korrekte formule ✓ subst. ✓ antw. (3)
8.3.1	$s = \frac{2}{3}\pi d$ $v = \frac{s}{t}$ $= \frac{2}{3} \times \pi \times 8$ $= \frac{16,76\text{km}}{\frac{40}{60}\text{h}}$ $= 16,76\text{km}$ $= 25,14\text{km/h}$	✓ subst. ✓ waarde van $s$ ✓ Subst. in $v = \frac{s}{t}$ ✓ antw. (4)
8.3.2	$v = \pi dn$ $25,14 = \pi \times 8 \times n$ Of $v = \frac{s}{t}$ $n = \frac{25,14}{\pi \times 8}$ $t = \frac{s}{v}$ $= 1\text{ rev/h}$ $= \frac{4\pi \times 8}{25,14\text{km / uur}}$ $\therefore t = \frac{4}{1}\text{ure}$ $= 4\text{ure}$ $= 4\text{ ure}$	✓ subst. in korrekte formule ✓ antw. (2)
		<b>[12]</b>

## QUESTION 9

9.1.1	$s = 2,1m \quad \theta = 1,8$ $s = r\theta$ $2,1 = r \times 1,8$ $r = 1,17m$	✓ subst. ✓ antw. (2)
9.1.2	Area van sektor $= \frac{1}{2}r^2\theta$ $= \frac{1}{2} \times (1,17)^2 \times 1,8$ $= 1,23m^2$	✓ korrekte formule ✓ subst. ✓ antw. (3)
9.2	$x = 200mm = 20cm \quad d = 36cm$ $4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(36)h + 20^2 = 0$ <b>OF</b> $h^2 - 36h + 100 = 0$ As $ah^2 + bh + c = 0$ Dan is $h = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-36) \pm \sqrt{(-36)^2 - 4(1)(100)}}{2(1)}$ $= \frac{36 \pm \sqrt{896}}{2}$ $\therefore h = 32,97cm \quad \text{of} \quad h = 3,03cm$	✓ formule ✓ subst. ✓ standaard vorm  ✓ subst. in kwadratiese formule  ✓ antw. (5)
		<b>[10]</b>

<b>VRAAG 10</b>		
10.1.1	$\begin{aligned} \text{Volume} &= l \times b \times h \\ &= 25 \times 14 \times 6 \\ &= 2100m^3 \\ &= 2100000 \text{ liter} \end{aligned}$	✓ subst. in korrekte formule ✓ herlei ✓ antw. (3)
10.1.2	$\begin{aligned} \text{Buite oppervl.} &= 2(L \times d) + (l \times b) + 2(d \times b) \\ \text{Buite oppervl.} &= 2(25 \times 6) + (25 \times 14) + 2(6 \times 14) \\ &= 300 + 350 + 168 \\ &= 818m^2 \\ \text{Koste van verf} &= R50 \times 818 \\ &= R40900 \end{aligned}$	✓ Formule ✓ Subst. ✓ antw.  ✓ Antw. met eenheid (4)
10.2	$\begin{aligned} \text{Buite oppervl. van hemisfeer} + \text{area van silinder} \\ &= \left(\frac{1}{2}\right)(4\pi r^2) + 2\pi r^2 + 2\pi rh \\ &= \left(\frac{1}{2}\right)(4)(\pi)(4)^2 + 2\pi(4)^2 + 2\pi(4)(16) \\ &= 603,18cm^2 \end{aligned}$	✓ formule ✓✓ subst. ✓ herlei ✓ antw. (5)
10.3	$\begin{aligned} \text{Area} &= (4)\left[\left(\frac{4+3,6}{2} + 4,5 + 4,7 + 4,9\right)\right] \\ &= 4(3,8 + 14,1) \\ &= 4(17,9) \\ &= 71,6m^2 \end{aligned}$ <p><b>OF</b></p> $\begin{aligned} \text{Area} &= 4\left(\frac{4+4,5}{2} + \frac{4,5+4,7}{2} + \frac{4,7+4,9}{2} + \frac{4,9+3,6}{2}\right) \\ &= 4(17,9) \\ &= 71,6m^2 \end{aligned}$	✓ Formule ✓ subst ✓ vereenvoudiging ✓ antw.  Of  ✓ Formule ✓ subst ✓ vereenvoudiging ✓ antw. (4) <b>[16]</b>
		<b>TOTAAL: 150</b>