**Possible Answers**
**Feb / Mar 2006**

QUESTION / VRAAG 1.1

| Indicate your choice with an X<br>Dui jou keuse aan met 'n X | | |
|---|---|---|
| | TRUE<br>WAAR | FALSE<br>ONWAAR |
| 1.1.1 | | X |
| 1.1.2 | | X |
| 1.1.3 | | X |
| 1.1.4 | | X |
| 1.1.5 | | X |
| 1.1.6 | X | |
| 1.1.7 | X | |
| 1.1.8 | | X |
| 1.1.9 | | X |
| 1.1.10 | | X |

QUESTION / VRAAG 1.2

| Indicate your choice with an X<br>Dui jou keuse aan met 'n X | | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | |
| 1.2.1 | | X | | | |
| 1.2.2 | | X | | | |
| 1.2.3 | | | X | | |
| 1.2.4 | | | | X | |
| 1.2.5 | | X | | | |
| 1.2.6 | X | | | | |
| 1.2.7 | | X | | | |
| 1.2.8 | | X | | | |
| 1.2.9 | | | | X | |
| 1.2.10 | | | | X | |

QUESTION / VRAAG 1.3

Indicate your choice
Dui jou keuse aan

| | |
|---|---|
| 1.3.1 | O |
| 1.3.2 | P |
| 1.3.3 | K |
| 1.3.4 | M |
| 1.3.5 | I |
| 1.3.6 | L |
| 1.3.7 | C |
| 1.3.8 | A |
| 1.3.9 | D |
| 1.3.10 | E |
| 1.3.11 | R |
| 1.3.12 | B |
| 1.3.13 | J |
| 1.3.14 | F |
| 1.3.15 | G |
| 1.3.16 | H |
| 1.3.17 | N |
| 1.3.18 | Q |
| 1.3.19 | S |
| 1.3.20 | T |

| *REMARK ONLY / SLEGS HERMERK* | | | | | | Question<br>Vraag | *NORMAL MARKING / NORMALE MERK* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Marks / Punte | | | Initials / Paraaf | | | | Marks / Punte | | | Initials / Paraaf | | |
| H | T | U | Mark | Mod | Cont | | H | T | U | Mark | Mod | Cont |
| | | | | | | 1 | | | | | | |
| | | | | | | 2 | | | | | | |
| | | | | | | 3 | | | | | | |
| | | | | | | 4 | | | | | | |
| | | | | | | 5 | | | | | | |
| | | | | | | 6 | | | | | | |
| | | | | | | 7 | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | Total<br>Totaal | | | | | | |

DISTRICT
DISTRIK

ANSWER / ANTWOORD 2.1.1
FOR LR (MOMENTS AROUND RR) / VIR LR (MOMENTE OM RR)

$(L \times 8m) = (4kN \times 6m) + (5kN \times 4m) + (8kN \times 2m)$

$8m\,L = 60\,kNm$

$L = 60\,kNm / 8m$

$L = 7{,}5\,kN$ ✓✓

ANSWER / ANTWOORD 2.1.1
FOR RR (MOMENTS AROUND LR) / VIR RR (MOMENTE OM RR)

$(R \times 8m) = (4kN \times 2m) + (5kN \times 4m) + (8kN \times 6m)$

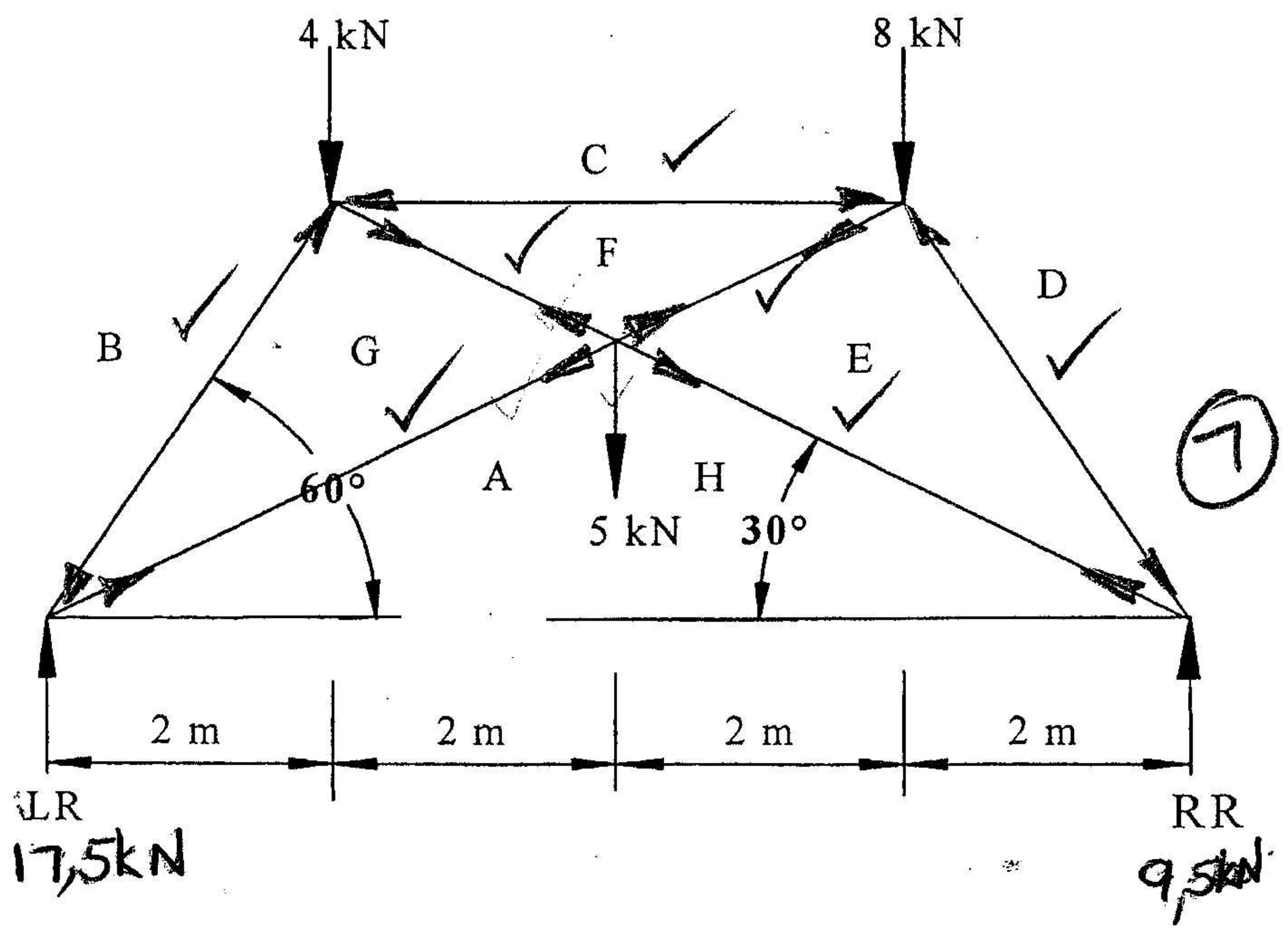
$8m\,R = 76\,kNm$

$R = 76\,kNm / 8m$

$R = 9{,}5\,kN$ ✓✓

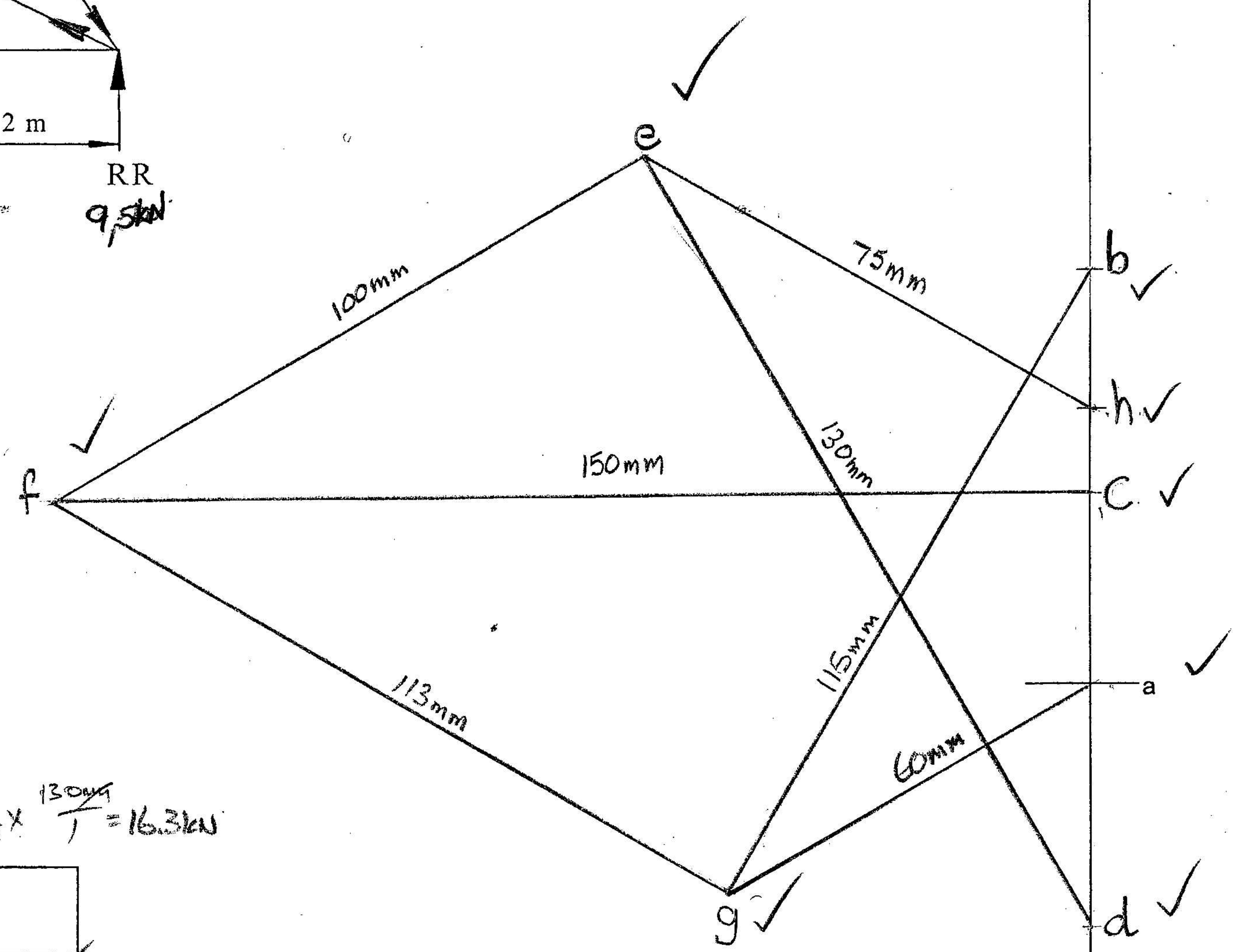
4

answer / antwoord 2.1.3




Answer / Antwoord 2.1.2

**Possible Answers**
**Feb / Mar 2006**




Force Diagram / ~~Kragtediagram~~

SCALE / SKAAL 8 mm : 1kN

8

DRAAI SKAAL OM
TURN SCALE AROUND

$AG = \frac{1kN}{8mm} \times \frac{60mm}{1} = 7{,}5kN$

$BG = \frac{1kN}{8mm} \times \frac{115mm}{1} = 14{,}4kN$

$CF = \frac{1kN}{8mm} \times \frac{150mm}{1} = 18{,}8kN$

$FG = \frac{1kN}{8mm} \times \frac{113mm}{1} = 14{,}1kN$

$\frac{1kN}{8mm} \times \frac{130mm}{1} = 16{,}3kN$

ANSWER / ANTWOORD 2.1.4

| MEMBER ONDERDEEL | MEASUREMENT AFMETING | FORCE KRAG | NATURE AARD |
|---|---|---|---|
| AG | 60 mm ✓ | 7,5kN ✓ | T ✓ |
| BG | 115 mm ✓ | 14,4kN ✓ | S ✓ |
| CF | 150 mm ✓ | 18,8kN ✓ | S ✓ |
| FG | 113 mm ✓ | 14,1kN ✓ | T ✓ |
| DE | 130 mm ✓ | 16,3kN ✓ | S ✓ |
| EF | 100 mm ✓ | 12,5kN ✓ | T ✓ |
| EH | 75 mm ✓ | 9,4kN ✓ | T ✓ |

21

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ANSWER QUESTION 3 / ANTWOORD VRAAG 3

3.1.1 BENDING MOMENT / BUIGMOMENTE

BM (A) = $(-6kN \times 0m) = 0kNm$ ✓✓

BM (B) = $(-6kN \times 4m) = -24kNm$ ✓✓

BM(C) = $(-6kN \times 8m) + (-10kN \times 4m)$

$= -48kNm - 40kNm$

$= -88kNm$ ✓✓

BM(D) = $(-6kN \times 10m) + (-10kN \times 6m) + (-15kN \times 2m)$

$= -60kNm - 60kNm - 30kNm$

$= -150kNm.$ ✓✓ (8)

3.1.2 SHEAR FORCES / SKUIFKRAGTE

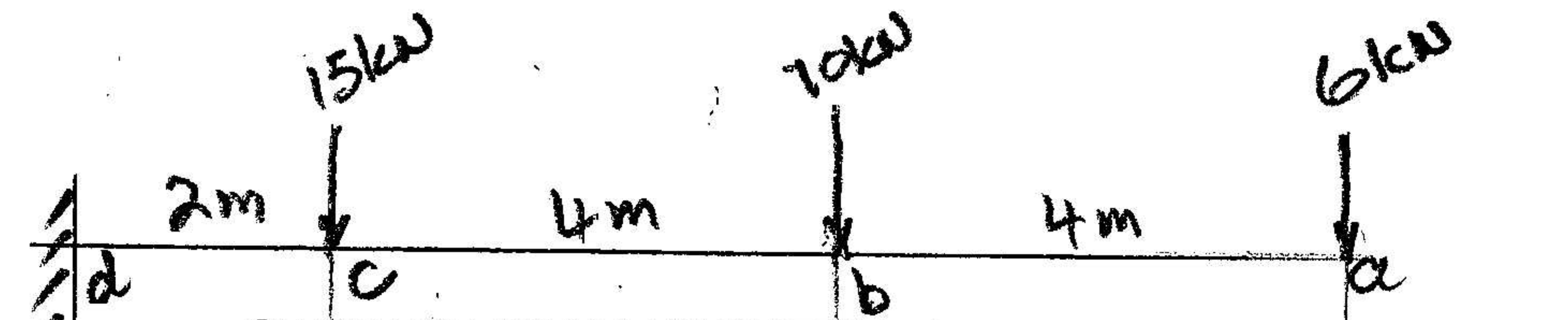
SF /SK (D) = $15kN + 10kN + 6kN = 31kN$ ✓✓

SF /SK (C) = $31kN - 15kN = 16kN$ ✓✓

SF / SK (B) $16kN - 10kN = 6kN$ ✓✓

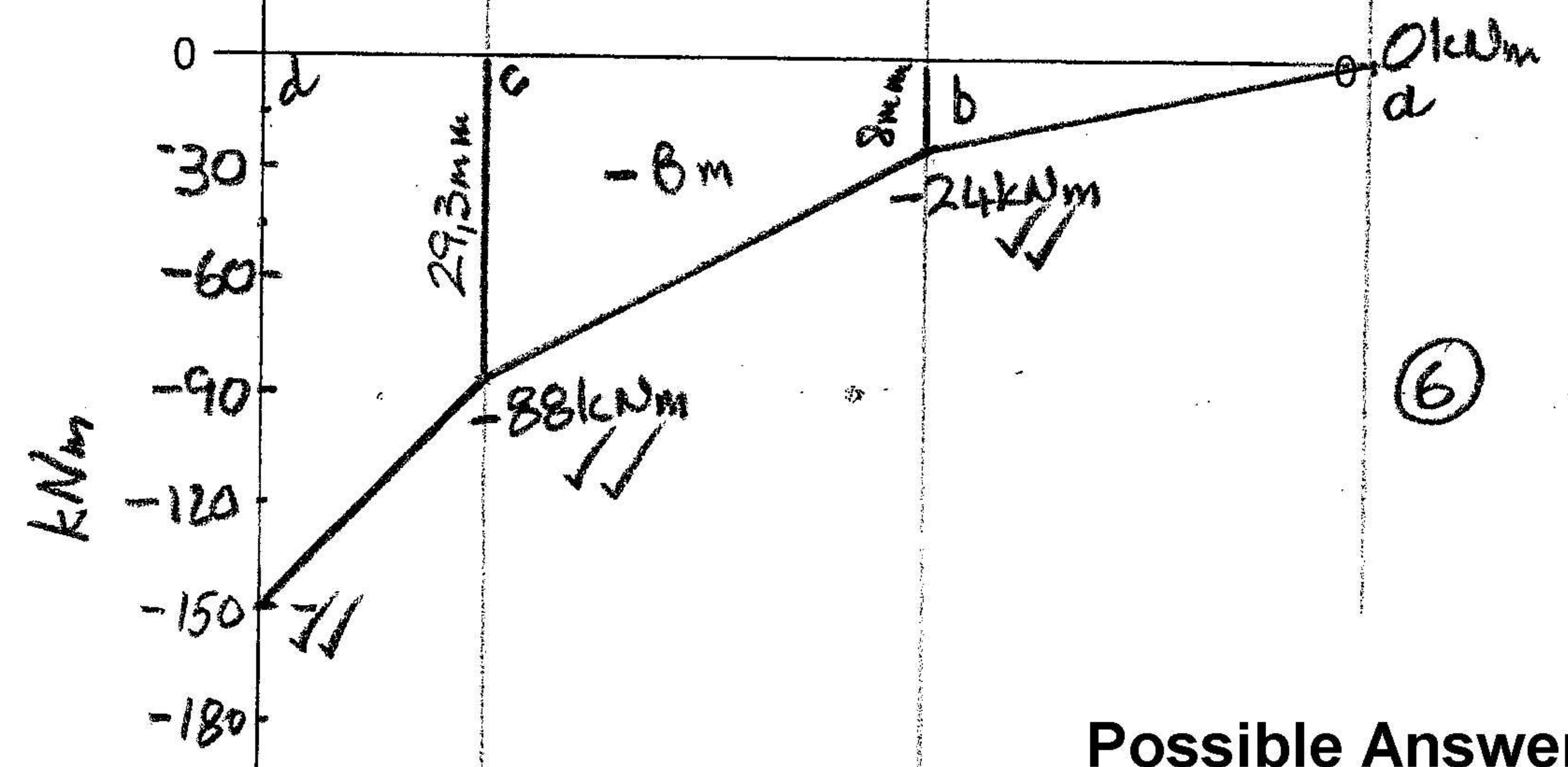
SF/SK (A) $6kN - 6kN = 0kN$ ✓✓

(8)




3.1.1 SPACE DIAGRAM / RUIMTEDIAGRAM

3.1.3 BENDING MOMENT DIAGRAM / BUIGMOMENTDIAGRAM



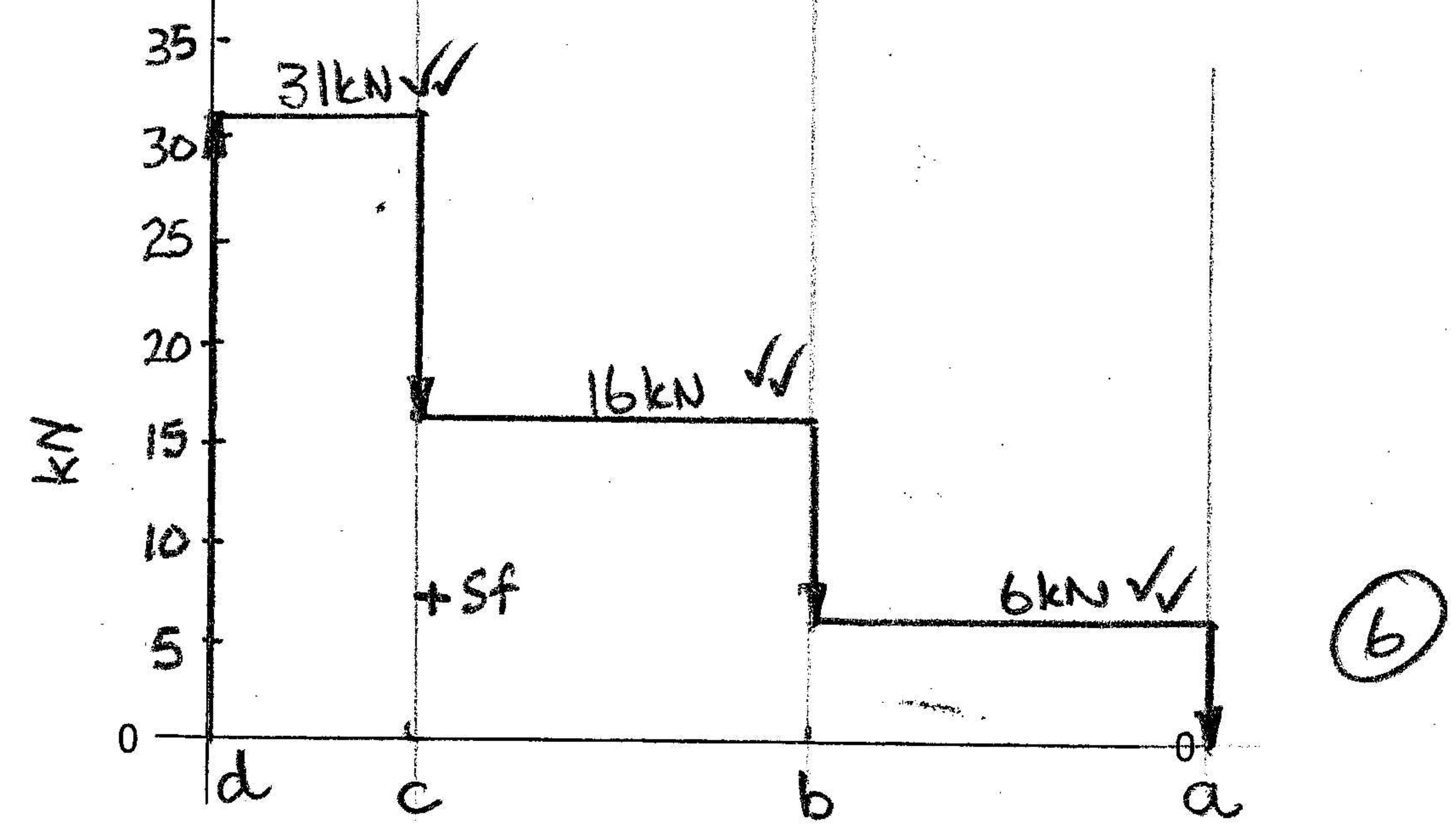

(6)

B = $\frac{5mm}{15kNm} \times \frac{-24kNm}{1}$ = 8mm

C = $\frac{5mm}{15kNm} \times \frac{88kNm}{1}$ = 29,3

D $\frac{5mm}{15kNm} \times \frac{150kNm}{1}$

**Possible Answers**
**Feb / Mar 2006**




(6)

3.1.4 SHEAR FORCE DIAGRAM / SKUIFKRAGDIAGRAM

D $\frac{2mm}{1kN} \times \frac{31kN}{1} = 62mm$

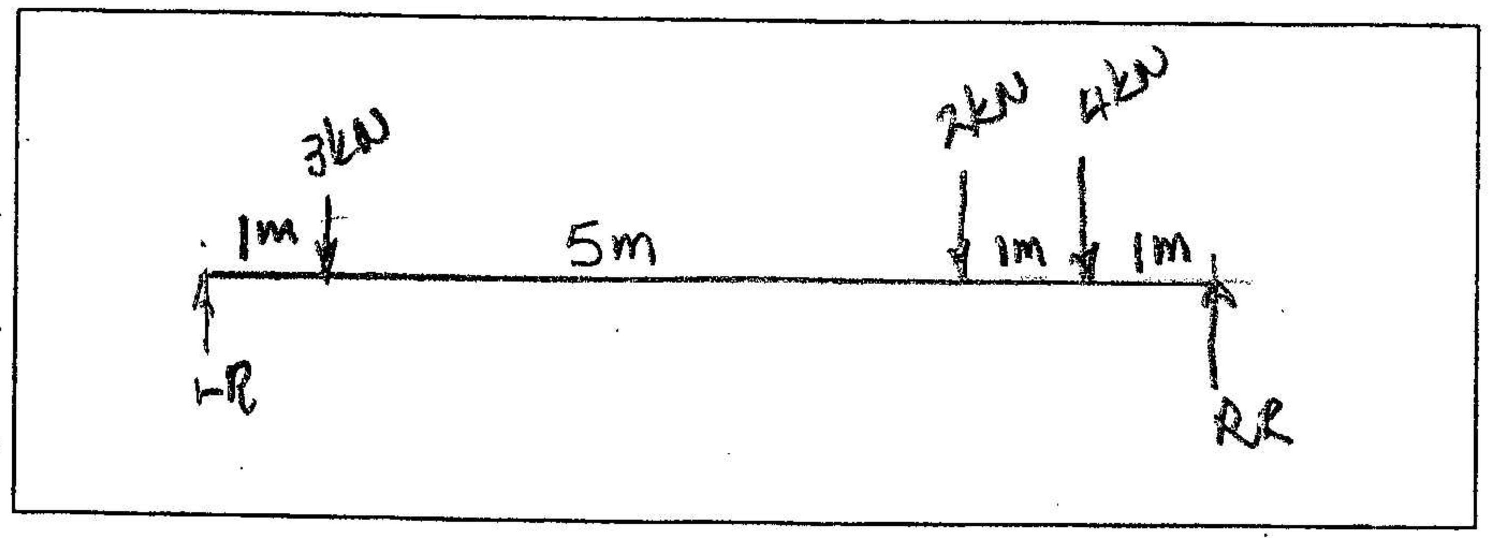
C $\frac{2mm}{1kN} \times \frac{16kN}{1} = 32$

QUESTION / VRAAG 3.2

3.2.1 Conversion/ OMSKAKELING

$\frac{2kN}{\cancel{A}} \times \frac{2\cancel{A}}{1}$

$= 4kN$ ✓✓ (2)




REDRAW DIAGRAM / HERTEKEN DIE DIAGRAM

3.2.2 FOR LR (MOMENTS AROUD RR) / VIR LR MOMENTE

$(L \times 8m) = (4kN \times 1m) + (2kN \times 2m) + (3kN \times 7m)$

$8m\,LR = 4kNm + 4kNm + 21kNm$

$LR = 29kNm / 8m$

$LR = 3,6kN.$ ✓

FOR RR (MOMENTS AROUND LR) / VIR RR (MOMENTE OM LR)

$(RR \times 8m) = (3kN \times 1m) + (2kN \times 6m) + (4kN \times 7m)$

$8m\,RR = 3kNm + 12kNm + 28kNm$

$RR = 43kNm / 8m$

$RR = 5,4kN$ ✓

(10)

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4.1.1 CHANGE IN LENGTH / LENGTEVERVORMING

$$STRAIN = \frac{\Delta L}{Lo}$$

$$\Delta L = 53{,}33 \times 10^{-3} \times 300\,mm$$

$$\Delta L = 16\,mm$$

(4)

4.1.2 STRESS / SPANNING = $E = \frac{SP./\delta}{STR\,(VV)}$

$$\delta = E \times STRAIN$$

$$\delta = 12{,}73 \times 10^{9} \times 53{,}33 \times 10^{-3}$$

$$\delta = 679\,MPa$$

(4)

4.1.3 CROSS-SECTIONAL AREA / DEURSNEE-OPPERVLAKTE

$$\delta = \frac{F}{A}$$

$$A = \frac{F}{\delta}$$

$$= \frac{120 \times 10^{3}\,N\,m^{2}}{679 \times 10^{6}\,N}$$

$$= 176{,}73 \times 10^{-6}\,m^{2}$$

(4)

4.1.4 DIAMETER / DIAMETER

$$A = \frac{\pi D^{2}}{4}$$

$$D = \sqrt{\frac{A \times 4}{\pi}}$$

$$D = \sqrt{\frac{176{,}73 \times 10^{-6}\,m^{2} \times 4}{\pi}}$$

$$D = 15 \times 10^{-3}\,m$$

$$D = 15\,mm$$

(6)

4.2 STRESS/ SPANNING

$$A = \frac{2300\,mm^{2}}{1000 \times 1000}$$

$$A = 2300 \times 10^{-6}\,m^{2}$$

$$\therefore \delta = \frac{F}{A}$$

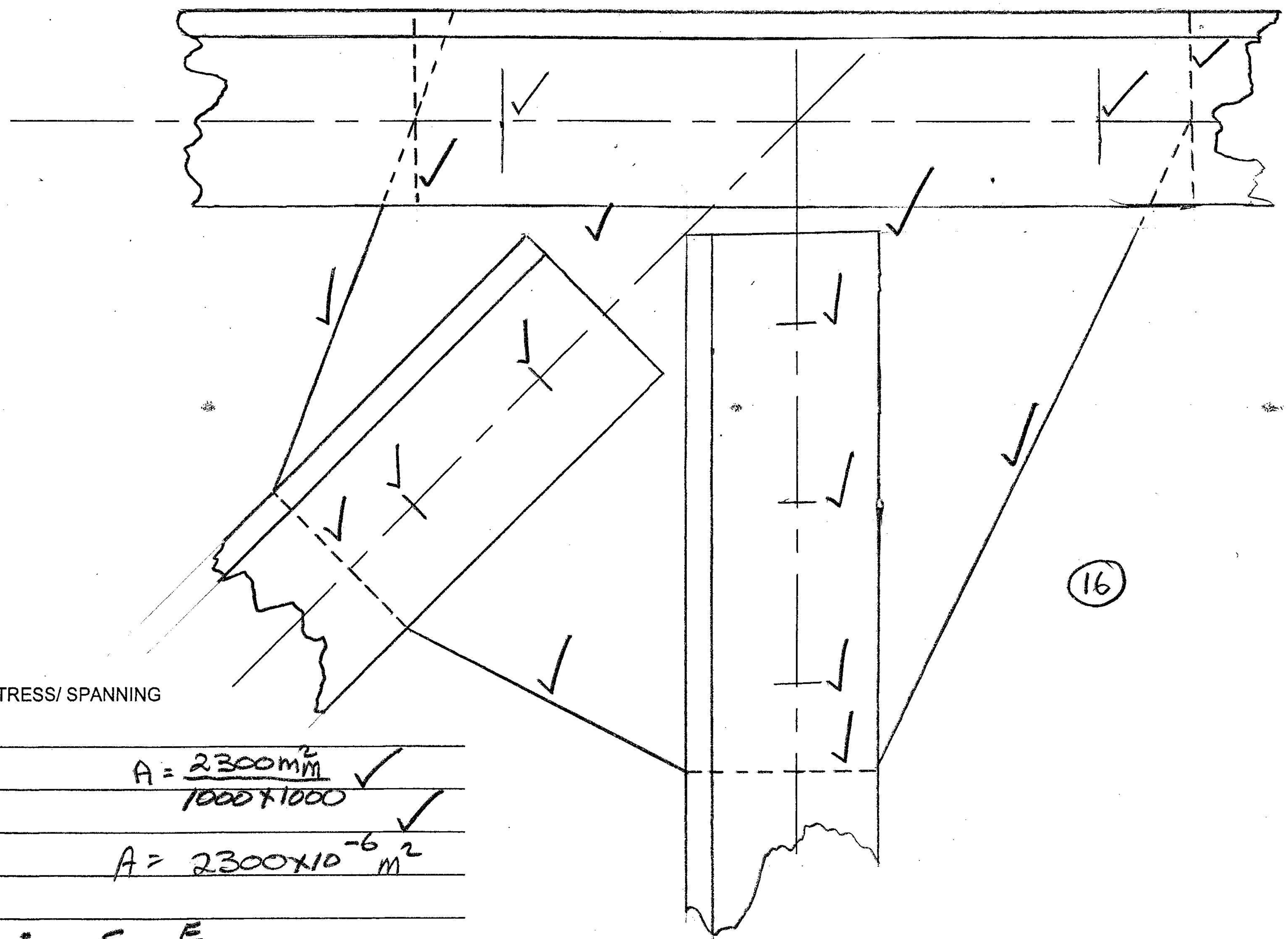
$$\delta = \frac{80 \times 10^{3}\,N}{2300 \times 10^{-6}\,m^{2}}$$

$$\delta = 34{,}78 \times 10^{6}\,Pa$$

$$\delta = 34{,}78\,MPa$$

(6)

4.3 GUSSET PLATE / KNOOPPLAAT



(16)

**Possible Answers**
**Feb / Mar 2006**

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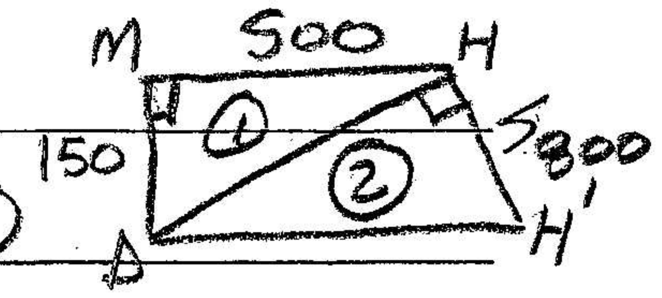
5.1.1 FOR TL YX[1] / VIR WL YX[1]

$YX' = \sqrt{200^2 + 800^2}$

$YX' = 824,62\,mm$ (5)

5.1.2 FOR TL DH[1] / WARE LENGTE DH[1]




$HD^2 = MH^2 + MD^2$ ---- (1)

$(H'D)^2 = HD^2 + (H'H)^2$ ---- (2)

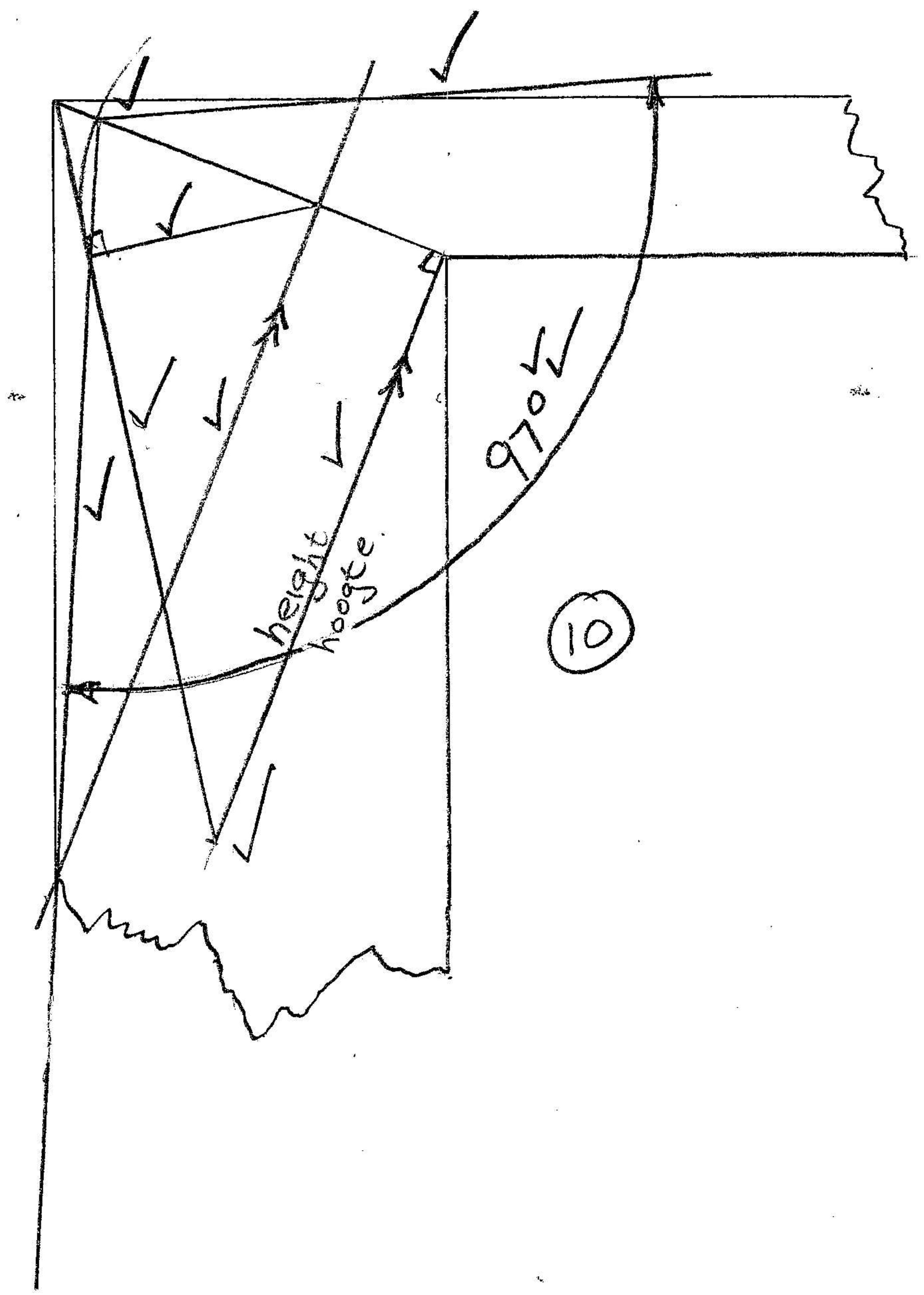
Replace (1) → (2) vervang (1) → (2)

$(H'D) = \sqrt{MH^2 + MD^2 + (H'H)^2}$

$= \sqrt{500^2 + 150^2 + 800^2}$

$= 955,25\,mm$ (10)

5.1.3 DIHEDRAL ANGLE / TWEEVLAK-HOEK




**Possible Answers**
**Feb / Mar 2006**

Question / Vraag 5

5.2
a) It saves time and money
b) Eliminates wastage of material
c) Eliminates repetitive marking off
d) They are very accurate
e) It is used for mass productions

a) Spaar tyd en geld
b) Elimineer die mors van materiaal
c) Elimineer herhaaldelike afmerkery
d) Dit is baie akkuraat
e) Word by massaproduksie gebruik

5.3
Ruler and steel tape
Punches, hammers and scribers
Drilling machines and planes
Hacksaw and coping saws
Set squares, chalk lines

Any other reasonable tools or equipment

Liniaal en staalmaatband
Ponse, hammers en kraspenne
Boormasjiene en skawe
Ystersaag en figuursaag
Winkelhake en krytlyn

5.4

| | |
|---|---|
| Template paper | Maatvorm-papier |
| Cardboard | Karton |
| Hardboard | Hardebord |
| Wood | Hout |
| Thin plate | Dun plaat |

5.5

| | |
|---|---|
| Good lighting | Goeie beligting |
| Floor board must be diagonally across | Vloerpanele moet diagonaal geplaas word |
| Enough space | Genoegsame spasie |

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6.1.1

| ITEM | QUANTITY NEEDED GETAL BENODIG | MATERIAL NEEDED MATERIAAL BENODIG | MASS /m LENGTH MASSA/m LENGTE | TOTAL MASS TOTALE MASSA | TARRIF/kg TARIEF/kg | R c |
|---|---|---|---|---|---|---|
| A | 2 | 100 100X 6 mm = (3,1x2) = 6,2m | 9 kg/m | 55,8 kg | R3.60/kg | R 200,88 |
| B | 2 | 100 100X 6 mm = (0,7x2) = 1,4m | 9 kg/m | 12,6 kg | R3.60/kg | R 45,36 |
| C | 4 | 50x50x 6 mm = (0,95x4) = 3,8m | 4,5 kg/m | 17,1 kg | R3.80/kg | R 64,98 |
| D | 3 | 50x50x 6 mm = (0,7x3) = 2,1 m | 4,5 kg/m | 9,45 kg | R3.80/kg | R 35,91 |
| | | | | WELDING MATERIAL COST SWEISMATERIAALKOSTE | | R 90,00 |
| | | | | TOTAL MATERIAL COST TOTALE MATERIAALKOSTE | | R 437,13 |

6.1.2 LABOUR COST / ARBEIDSKOSTE

$\frac{R120,00}{h} \times \frac{6h}{1}$

= R720,00

**Possible Answers**
**Feb / Mar 2006**

6.1.3 OVERHEAD COST / OORHOOFSE KOSTE

$\frac{85}{100} \times \frac{R720,00}{1}$

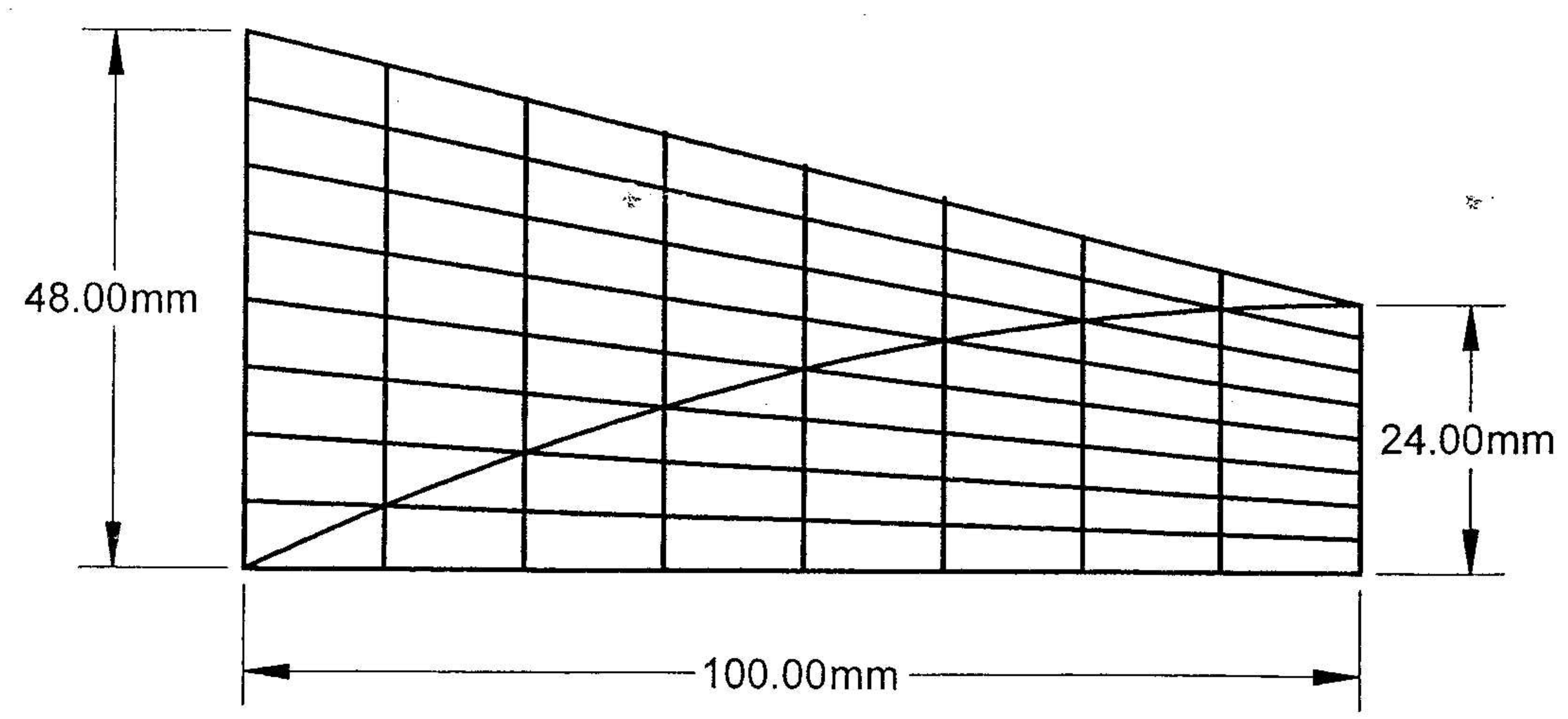
= R 612,00

6.1.4 TOTAL COST / TOTALE KOSTE

R437,13 + R720,00 + R612,00

= R 1769,13

6.2 Draw camber on line / Teken kromming op die lyn
Scale / Skaal 1:50

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VRAAG 7

7.1 Undercut / Inkarteling
Poor fusion / Swak samesmelting
Cracks / Krake
Slag inclusions / Slak-insluiting
Distortion / Verwringing

7.2 *Any four of the following*
Increase ductility
Improve machining quality
Release tension
To change grain size
To increase hardness and tensile strength
To change the chemical composition of steel (case-hardening)
To change the magnetic properties
To change electrical conductivity
To cause toughness
To re-crystallize metals that have been cold worked

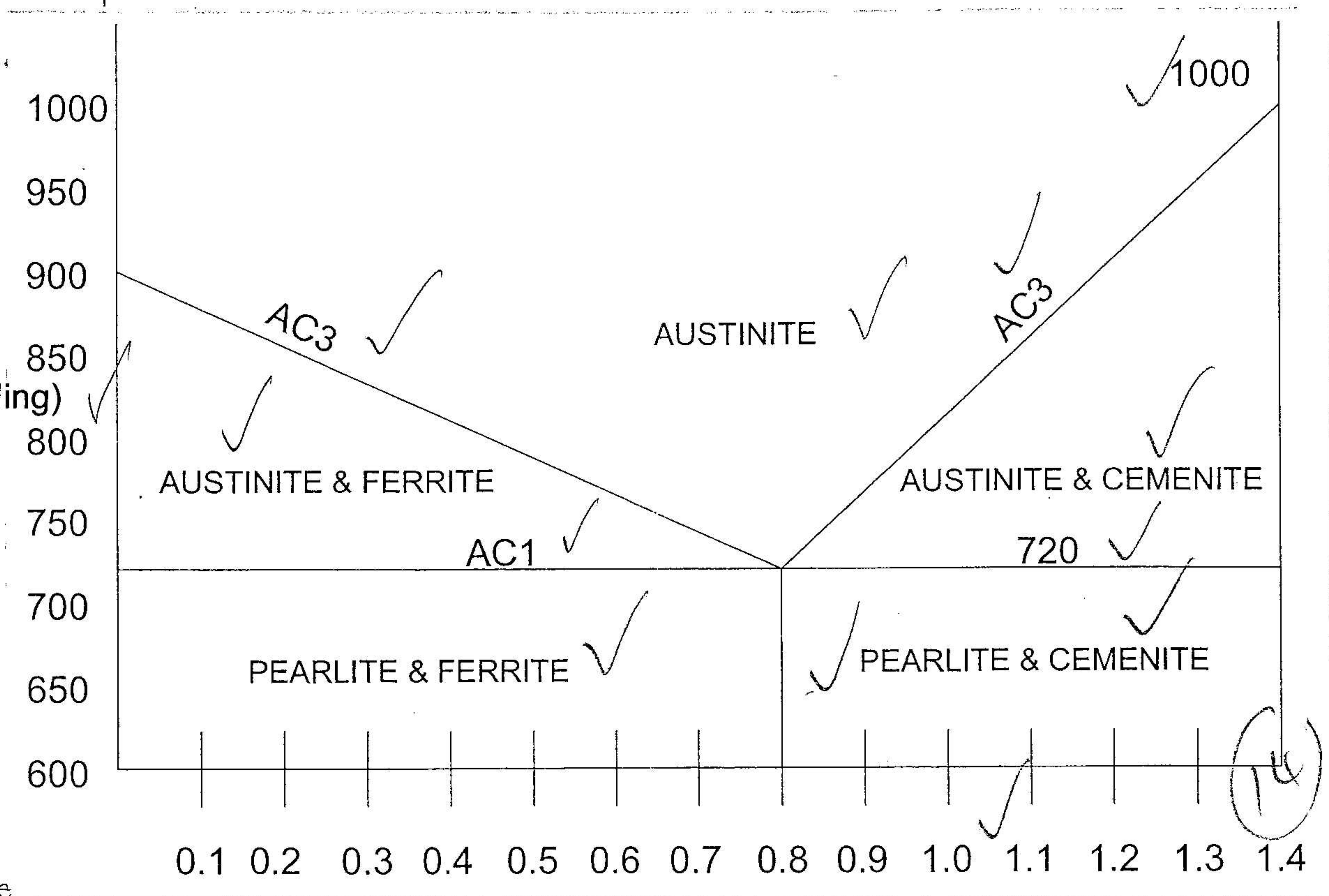
*Enige vier van die volgende*
Om rekbaarheid te verhoog
Om die masjineer-eienskappe van staal te verbeter
Om spanning te verlig
Om die korrelgrootte te verander
Om hardheid en trekspanning te verhoog
Om die chemiese samestelling van staal te verander (dopverharding)
Om die magnetiese eienskappe te verbeter
Om elektriese geleiding te verbeter
Om hardheid te verkry
Om korrelstrukture te herkristalliseer wat koudbewerk is

7.3 Chrome / Chroom
Nickel / Nikkel
Manganese / Mangaan
Tungstan / Wolfram
Silicon / Silikon

7.4 Elasticity is the ability of steel to return to its original shape and size after the load has been removed.

Elastitisteit is die vermoë van staal om na sy oorspronklike vorm en grootte terug te keer nadat die las verwyder is.

7.5




USE THE FOLLOWING SCALES
GEBRUIK DIE VOLGENDE SKALE

1CM : 0.1% CARBON /KOOLSTOF
1CM : 50°C

7.5.1 720°C

7.5.2 quenching / Onderdompeling
brush of cold air / Blaas met koue lug
cool in furnace / Verkoel in die oond
place between bricks / Plaas tussen bakstene
place at a wind-free corner / Plaas op 'n windvrye plek

7.5.3 cool in furnace / laat in oond afkoel

7.5.4 720°C

**Possible Answers**
**Feb / Mar 2006**

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