OLD MUTUAL
SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2020 FIRST ROUND
JUNIOR SECTION: GRADE 8

12 March 2020 **Time: 60 minutes** **Number of questions: 20**

Instructions

1. *This is a multiple choice question paper. Each question is followed by five answers marked A, B, C, D and E. Only one of these is correct.*
2. *Scoring rules:*
   2.1. *Each correct answer is worth 5 marks.*
   2.2. *There is no penalty for an incorrect answer or any unanswered question.*
3. *You must use an HB pencil. Rough work paper, a ruler and an eraser are permitted.* ***Calculators and geometry instruments are not permitted.***
4. *Figures are not necessarily drawn to scale.*
5. *Indicate your answers on the sheet provided.*
6. *The centre page is an information and formula sheet. Please tear out the page for your own use.*
7. *Start when the invigilator tells you to do so.*
8. *Answers and solutions will be available at* `www.samf.ac.za`

Do not turn the page until you are told to do so.
Draai die boekie om vir die Afrikaanse vraestel.

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Organisations involved: AMESA, SA Mathematical Society,
SA Akademie vir Wetenskap en Kuns, ASTEMI

1. $\frac{2020}{202} =$

(A) 0 (B) 2 (C) 5 (D) 8 (E) 10

2. How many seconds are there in 20 minutes?

(A) 1200 (B) 1140 (C) 1080 (D) 1020 (E) 960

3. $\sqrt{2 \times 10 \times 2 \times 10} =$

(A) 10 (B) 20 (C) 30 (D) 40 (E) 50

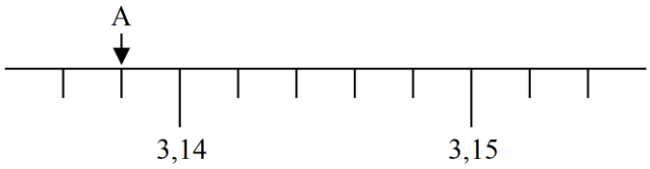
4. A train is scheduled to leave the station at 20:20. The journey takes 20 minutes, and the train leaves 20 minutes late. At what time does it arrive at its destination?

(A) 19:00 (B) 20:00 (C) 21:00 (D) 22:00 (E) 23:00

5. Each step a duck takes is 20 cm. How many steps must the duck take to walk 20 m?

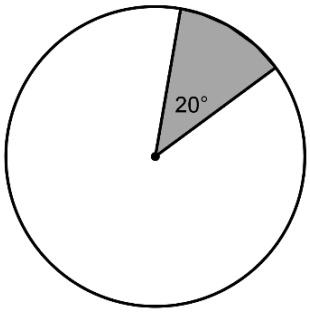
(A) 20 (B) 40 (C) 60 (D) 80 (E) 100

6. What number is indicated by A on the ruler?



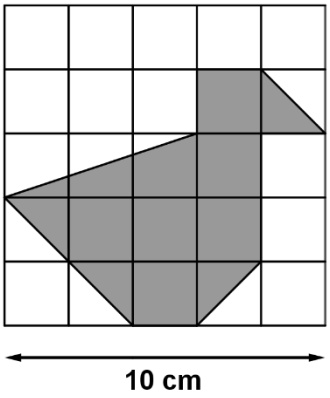
(A) 3,04 (B) 3,1 (C) 3,123 (D) 3,13 (E) 3,138

7. What fraction of the circle is shaded?



(A) $\frac{1}{20}$ (B) $\frac{1}{18}$ (C) $\frac{1}{16}$ (D) $\frac{1}{14}$ (E) $\frac{1}{12}$

8. The diagram shows 25 identical square tiles. Determine the area of the shaded duck in cm^2.



(A) 30 (B) 34 (C) 36 (D) 38 (E) 40

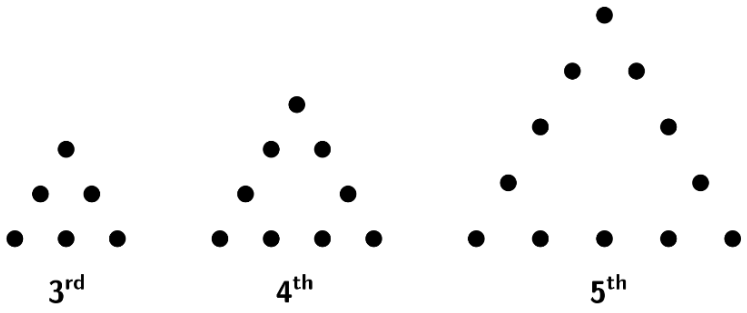
9. Janice chooses two different numbers from the set {1 ; 2 ; 3 ; 4 ; 5} and multiplies them together. What is the probability that the product is even?

(A) $\frac{3}{10}$ (B) $\frac{1}{2}$ (C) $\frac{3}{5}$ (D) $\frac{7}{10}$ (E) $\frac{4}{5}$

10. I have 12 paint tins each capable of holding 12 litres. Half of them are half full. A third of them are a third full. The rest are one-sixth full. How many litres of paint do I have in total?

(A) 48 (B) 50 (C) 52 (D) 54 (E) 56

11. A series of triangles are made from dots. The 3rd, 4th and 5th triangles are shown below. How many dots are there in the 50th triangle?



(A) 143 (B) 145 (C) 147 (D) 149 (E) 151

12. The average of five different natural numbers is 9. What is the greatest possible value of any one of these numbers?

(A) 35 (B) 36 (C) 38 (D) 40 (E) 41

13. At the beginning of each day Llewellyn eats 20% of the sweets that he has in a jar. At the end of the second day, 32 sweets remain. How many sweets were there originally in the jar?

(A) 48 (B) 50 (C) 52 (D) 54 (E) 56

14. A bag contains R100, R50, R20 and R10 notes. There are 10 of each note. You put your hand into the bag and take out a note. If you keep doing this until you have four notes of the same value, what is the largest amount of money you could have?

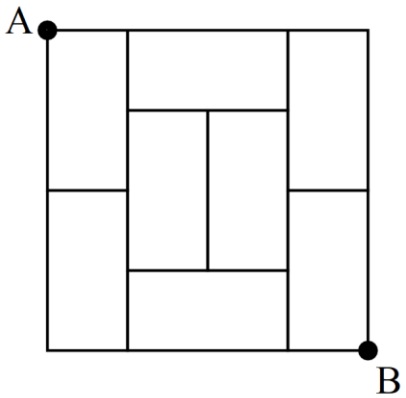
(A) R640 (B) R630 (C) R620 (D) R610 (E) R600

15. The digits 2, 4, 5, 6, 8 and 9 must replace the letters *a* to *f* in the grid below so that the sum of each column and each row equals K. Determine the value of K.

7	*a*	*b*	1
c			*d*
3	*e*	*f*	10

(A) 16 (B) 17 (C) 18 (D) 19 (E) 20

16. Each rectangle below is 2 cm by 1 cm. What is the length, in centimetres, of the longest path from A to B along the edges? You can travel in any direction, but you may not go over the same edge more than once.



(A) 21 (B) 22 (C) 23 (D) 24 (E) 25

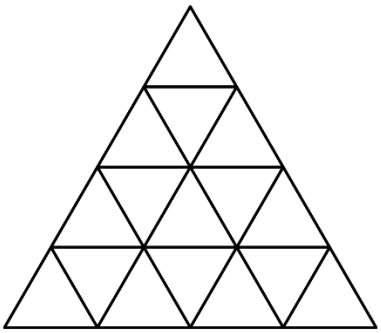
17. How many 3-digit numbers are divisible by all three of the numbers 9, 10 and 12?

(A) 2 (B) 3 (C) 5 (D) 6 (E) 7

18. At 6 a.m. a clock was showing the correct time. It then lost 5 minutes every hour. The clock stopped two hours ago and is now showing the time 5 p.m. What is the correct time now?

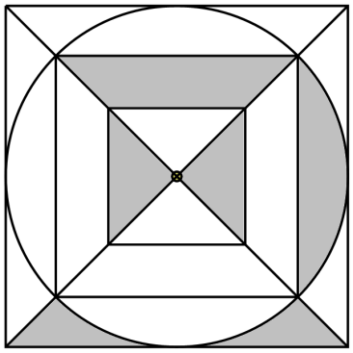
(A) 7:55 p.m. (B) 8:00 p.m. (C) 3:55 p.m. (D) 4:00 p.m. (E) 8:05 p.m.

19. The diagram shows a grid of sixteen identical equilateral triangles. How many different rhombuses can be formed from two adjacent small triangles?



(A) 14 (B) 16 (C) 18 (D) 20 (E) 22

20. In the diagram the shaded area is 136 cm^2. The largest square has a side length of 20 cm. Determine the perimeter of the smallest square in cm.



(A) 48 (B) 46 (C) 44 (D) 42 (E) 40

Formula and Information Sheet

1.1 The natural numbers are: 1; 2; 3; 4; 5; …

1.2 The whole numbers are: 0; 1; 2; 3; 4; 5; …

1.3 The integers are: …; –4; –3; –2; –1; 0; 1; 2; 3; 4; 5; …

2. In the fraction $\frac{a}{b}$, a is called the numerator and b the denominator.

3.1 Exponential notation:

$2 \times 2 \times 2 \times 2 \times 2 = 2^5$

$3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$

$a \times a \times a \times a \times \ldots \times a = a^n$ (n factors of a)

(a is the base and n is the index (exponent))

3.2 Factorial notation:

2! = 2 x 1 = 2

3! = 3 x 2 x 1 = 6

4! = 4 x 3 x 2 x 1 = 24

1 x 2 x 3 x …. x n = n!

3.3 $1 + 2 + 3 + 4 \ldots. + n = \frac{1}{2}n(n+1)$

4 Area of a

4.1	triangle is:	$\frac{1}{2} \times$ (base $\times$ height) = $\frac{1}{2}(b.h)$
4.2	rectangle is:	length $\times$ width = lw length $\times$ breadth = lb
4.3	square is:	side $\times$ side = s^2
4.4	rhombus is:	$\frac{1}{2} \times$ (product of diagonals)
4.5	trapezium is:	$\frac{1}{2} \times$ (sum of parallel sides) $\times$ height
4.6	circle is:	πr^2 (r = radius)

5 Surface area of a:

5.1 rectangular prism is: $2lb + 2lh + 2bh\,(h = \text{height})$

5.2 sphere is: $4\pi r^2$

6 Perimeter of a:

6.1 rectangle is: $2 \times \text{length} + 2 \times \text{breadth}$

$2l + 2b$

or $2l + 2w$ $(w = \text{width})$

6.2 square is: $4s$

7. Circumference of a circle is: $2\pi r$

8. Volume of a:

8.1 cube is: $s \times s \times s = s^3$

8.2 rectangular prism is: $l \times b \times h$

8.3 cylinder is: $\pi r^2 h$

9.1 Volume of a right prism is: area of cross-section × perpendicular height

or area of base × perpendicular height

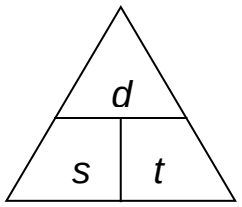
9.2 Surface area of a right prism is: (perimeter of base × h) + (2 × area of base)

10. Sum of the interior angles of a polygon is: $180^\circ(n-2)$ $[n = \text{number of sides}]$

11. Distance = speed × time $(d = s \times t)$

Speed = distance ÷ time $(s = \frac{d}{t})$

Time = distance ÷ speed $(t = \frac{d}{s})$

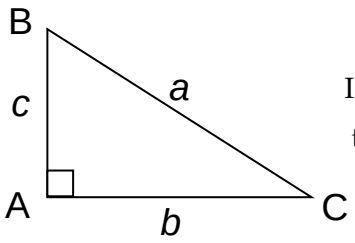


$d = s \times t$

$s = \frac{d}{t}$

$t = \frac{d}{s}$

12. Pythagoras:



If ΔABC is a right-angled triangle, then $a^2 = b^2 + c^2$

13. Conversions:

1 cm³ = 1 mℓ ; 1000 cm³ = 1 ℓ

1000 m = 1 km ; 1000 g = 1 kg ; 100 cm = 1 m

5. Buite-oppervlakte van 'n

5.1 regte prisma is: $2lb + 2lh + 2bh$ (h = hoogte)

5.2 sfeer is: $4\pi r^2$

6 Omtrek van 'n:

6.1 reghoek is: 2×lengte + 2×breedte
$2l + 2b$

6.2 vierkant is: $4s$

7. Omtrek van 'n sirkel is: $2\pi r$

8. Volume van 'n:

8.1 kubus is: $s \times s \times s = s^3$

8.2 reghoekige prisma is: $l \times b \times h$

8.3 silinder is: $\pi r^2 h$

9.1 Volume van 'n regte prisma is: oppervlakte van dwarssnit × hoogte
of oppervlakte van basis × hoogte

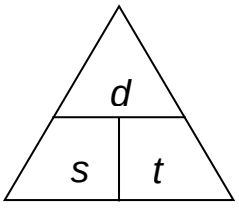
9.2 Buite-oppervlakte van 'n regte prisma is:
(omtrek van basis × h) + (2 × oppervlakte van basis)

10. Som van die binnehoeke van 'n veelhoek is: $180^\circ(n-2)$ [n = aantal sye]

11. Afstand is: spoed x tyd $(d = s \times t)$

Spoed = afstand ÷ tyd $(s = \frac{d}{t})$

Tyd = afstand ÷ spoed $(t = \frac{d}{s})$

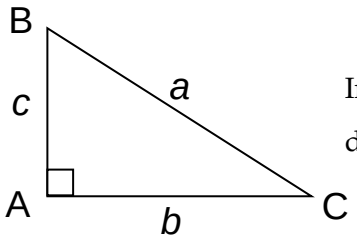


$d = s \times t$

$s = \frac{d}{t}$

$t = \frac{d}{s}$

12. Pythagoras:



Indien ΔABC 'n reghoekige driehoek is, dan sal $a^2 = b^2 + c^2$

13. Omskakelings:

1 cm³ = 1 mℓ ; 1000 cm³ = 1 ℓ

1000 m = 1 km; 1000 g = 1 kg ; 100 cm = 1 m

Formule- en Inligtingblad

1.1 Die natuurlike getalle is: 1; 2; 3; 4; 5; …

1.2 Die telgetalle is: 0; 1; 2; 3; 4; 5; …

1.3 Die heelgetalle is: …, –4; –3; –2; –1; 0; 1; 2; 3; 4; 5; …

2. In die breuk $\frac{a}{b}$, word a die teller en b die noemer genoem.

3.1 Eksponensiële notasie:

$2 \times 2 \times 2 \times 2 \times 2 = 2^5$

$3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$

$a \times a \times a \times a \times \ldots\ldots \times a = a^n$ (n faktore van a)

(a is die grondtal en n is die indeks (eksponent))

3.2 Fakulteitnotasie:

$2! = 2 \times 1 = 2$

$3! = 3 \times 2 \times 1 = 6$

$4! = 4 \times 3 \times 2 \times 1 = 24$

$1 \times 2 \times 3 \times \ldots. \times n = n!$

3.3 $1 + 2 + 3 + 4 \ldots. + n = n(n + 1)/2$

4 Oppervlakte van 'n:

4.1 driehoek is: $\frac{1}{2} \times$ (basis $\times$ loodregte hoogte) = $\frac{1}{2}(b.h)$

4.2 reghoek is: lengte $\times$ breedte = lb

4.3 vierkant is: sy $\times$ sy = s^2

4.4 ruit (rombus) is: $\frac{1}{2}$ (produk van die diagonale)

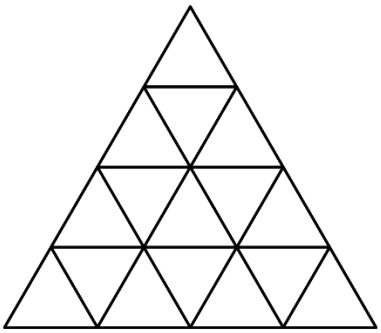
4.5 trapesium is: $\frac{1}{2}(\text{som van ewewydige sye}) \times \text{hoogte}$

4.6 sirkel is: πr^2 (r = radius)

18. Om 6 vm. het ’n horlosie die korrekte tyd aangetoon. Dit het daarna elke uur, 5 minute verloor. Die horlosie het twee ure terug gestop en toon nou die tyd 5 nm. Wat is die korrekte tyd nou?

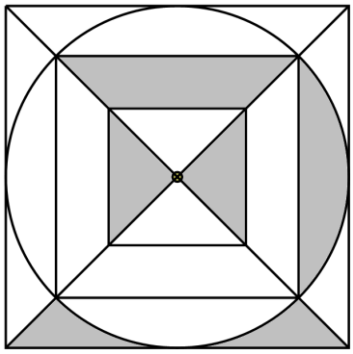
(A) 7:55 nm. (B) 8:00 nm. (C) 3:55 nm. (D) 4:00 nm. (E) 8:05 nm.

19. Die diagram toon ’n rooster van sestien identiese gelyksydige driehoeke. Hoeveel verskillende ruite kan deur twee aangrensende klein driehoeke gevorm word?



(A) 14 (B) 16 (C) 18 (D) 20 (E) 22

20. Die ingekleurde oppervlakte in die diagram is 136 cm^2. Die grootste vierkant het ’n sylengte van 20 cm. Bereken die omtrek van die kleinste vierkant in cm.



(A) 48 (B) 46 (C) 44 (D) 42 (E) 40

13. Aan die begin van elke dag eet Llewellyn 20% van die lekkers wat hy in ’n fles het. Aan die einde van die tweede dag bly daar 32 lekkers oor. Hoeveel lekkers was oorspronklik in die fles?

(A) 48 (B) 50 (C) 52 (D) 54 (E) 56

14. ’n Sak bevat R100, R50, R20 en R10 note. Daar is 10 van elke noot. Jy steek jou hand in die sak en haal ’n noot uit. As jy dit bly doen totdat jy vier note van dieselfde waarde het, wat is die grootste bedrag geld wat jy kan hê?

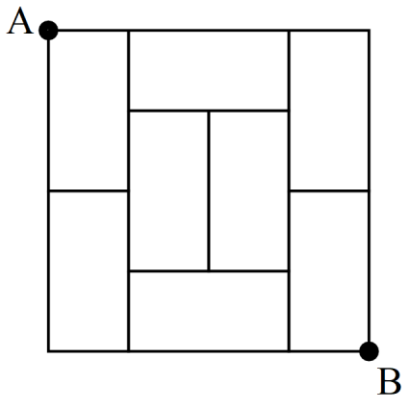
(A) R640 (B) R630 (C) R620 (D) R610 (E) R600

15. Die syfers 2, 4, 5, 6, 8 en 9 moet die letters *a* tot *f* vervang in die rooster hieronder sodat die som van elke kolom en elke ry gelyk is aan K. Bepaal die waarde van K.

7	*a*	*b*	1
c			*d*
3	*e*	*f*	10

(A) 16 (B) 17 (C) 18 (D) 19 (E) 20

16. Elke reghoek hieronder is 2 cm by 1 cm. Wat is die lengte, in sentimeter, van die langste pad van A na B langs die sye? Jy kan in enige rigting beweeg, maar jy mag nie meer as een keer oor dieselfde sy beweeg nie.

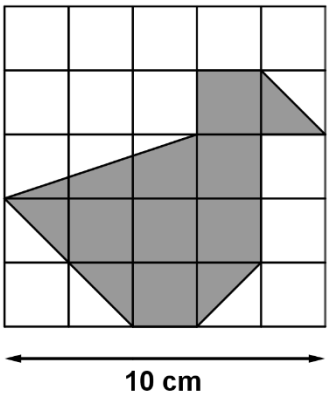


(A) 21 (B) 22 (C) 23 (D) 24 (E) 25

17. Hoeveel 3-syfer getalle is deelbaar deur al drie die getalle 9, 10 en 12?

(A) 2 (B) 3 (C) 5 (D) 6 (E) 7

8. Die diagram toon 25 identiese vierkantige teëls. Bepaal die oppervlakte van die ingekleurde eend in cm^2.



(A) 30 (B) 34 (C) 36 (D) 38 (E) 40

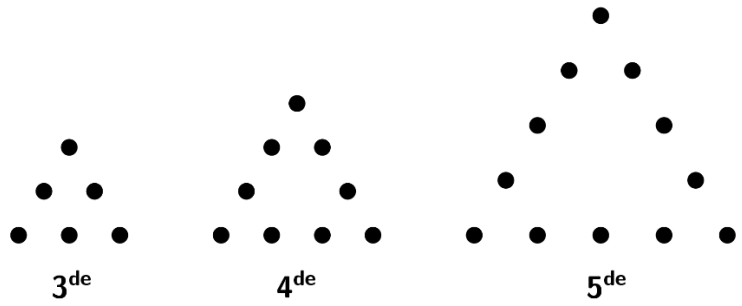
9. Janice kies twee verskillende getalle uit die versameling {1 ; 2 ; 3 ; 4 ; 5} en vermenigvuldig hulle. Wat is die waarskynlikheid dat die produk ewe is?

(A) $\frac{3}{10}$ (B) $\frac{1}{2}$ (C) $\frac{3}{5}$ (D) $\frac{7}{10}$ (E) $\frac{4}{5}$

10. Ek het 12 verfblikke wat elk 12 liter kan bevat. Die helfte van hulle is halfvol. ’n Derde van hulle is ’n derde vol. Die res is een-sesde vol. Hoeveel liter verf het ek in totaal?

(A) 48 (B) 50 (C) 52 (D) 54 (E) 56

11. ’n Reeks driehoeke word gevorm deur kolletjies. Die 3^{de}, 4^{de} en 5^{de} driehoeke word hieronder getoon. Hoeveel kolletjies is daar in die 50^{ste} driehoek?



(A) 143 (B) 145 (C) 147 (D) 149 (E) 151

12. Die gemiddeld van vyf verskillende natuurlike getalle is 9. Wat is die grootste moontlike waarde van enige een van hierdie getalle?

(A) 35 (B) 36 (C) 38 (D) 40 (E) 41

1. $\frac{2020}{202} =$

(A) 0 (B) 2 (C) 5 (D) 8 (E) 10

2. Hoeveel sekondes is daar in 20 minute?

(A) 1200 (B) 1140 (C) 1080 (D) 1020 (E) 960

3. $\sqrt{2 \times 10 \times 2 \times 10} =$

(A) 10 (B) 20 (C) 30 (D) 40 (E) 50

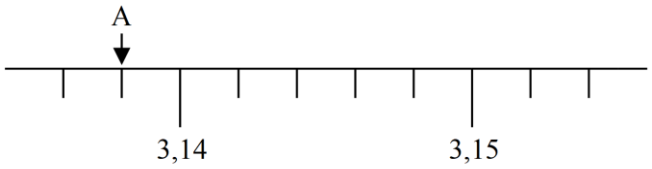
4. ’n Trein is geskeduleer om die stasie teen 20:20 te verlaat. Die reis neem 20 minute en die trein vertrek 20 minute laat. Teen watter tyd sal dit sy bestemming bereik?

(A) 19:00 (B) 20:00 (C) 21:00 (D) 22:00 (E) 23:00

5. Elke treë wat ’n eend gee is 20 cm. Hoeveel treë moet die eend gee om 20 m te stap?

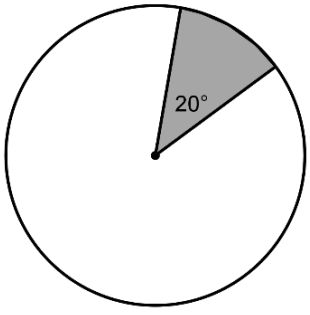
(A) 20 (B) 40 (C) 60 (D) 80 (E) 100

6. Watter getal word deur A op die liniaal voorgestel?



(A) 3,04 (B) 3,1 (C) 3,123 (D) 3,13 (E) 3,138

7. Watter breukdeel van die sirkel is ingekleur?



(A) $\frac{1}{20}$ (B) $\frac{1}{18}$ (C) $\frac{1}{16}$ (D) $\frac{1}{14}$ (E) $\frac{1}{12}$

OLD MUTUAL
SUID-AFRIKAANSE WISKUNDE-OLIMPIADE

Georganiseer deur die
SOUTH AFRICAN MATHEMATICS FOUNDATION

2020 EERSTE RONDTE
JUNIOR AFDELING: GRAAD 8

12 Maart 2020 **Tyd: 60 minute** **Aantal vrae: 20**

Instruksies

1. *Hierdie is 'n veelvuldige-keuse vraestel. Na elke vraag is vyf antwoorde, genommer A, B, C, D en E. Net een van hulle is reg.*
2. *Puntetoekenning:*
   2.1. *Elke korrekte antwoord tel 5 punte.*
   2.2. *Daar is geen penalisering vir foutiewe antwoorde of vrae wat nie beantwoord is nie.*
3. *Gebruik 'n HB potlood. Papier vir rofwerk, 'n liniaal en uitveër word toegelaat.* ***Sakrekenaars en meetkunde-instrumente word nie toegelaat nie.***
4. *Figure is nie noodwendig volgens skaal geteken nie.*
5. *Beantwoord die vrae op die antwoordblad wat voorsien word.*
6. *Die binneblad is 'n inligtings- en formuleblad. Skeur dit asseblief uit vir jou gebruik.*
7. *Begin sodra die toesighouer die teken gee.*
8. *Antwoorde en oplossings sal beskikbaar wees by* `www.samf.ac.za`

Moenie omblaai voordat dit aan jou gesê word nie.
Turn the booklet over for the English paper.

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