

THE OLD MUTUAL SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2022 SECOND ROUND JUNIOR SECTION: GRADE 8 & 9

12 May 2022

Time: 120 minutes

Number of questions: 25

Instructions

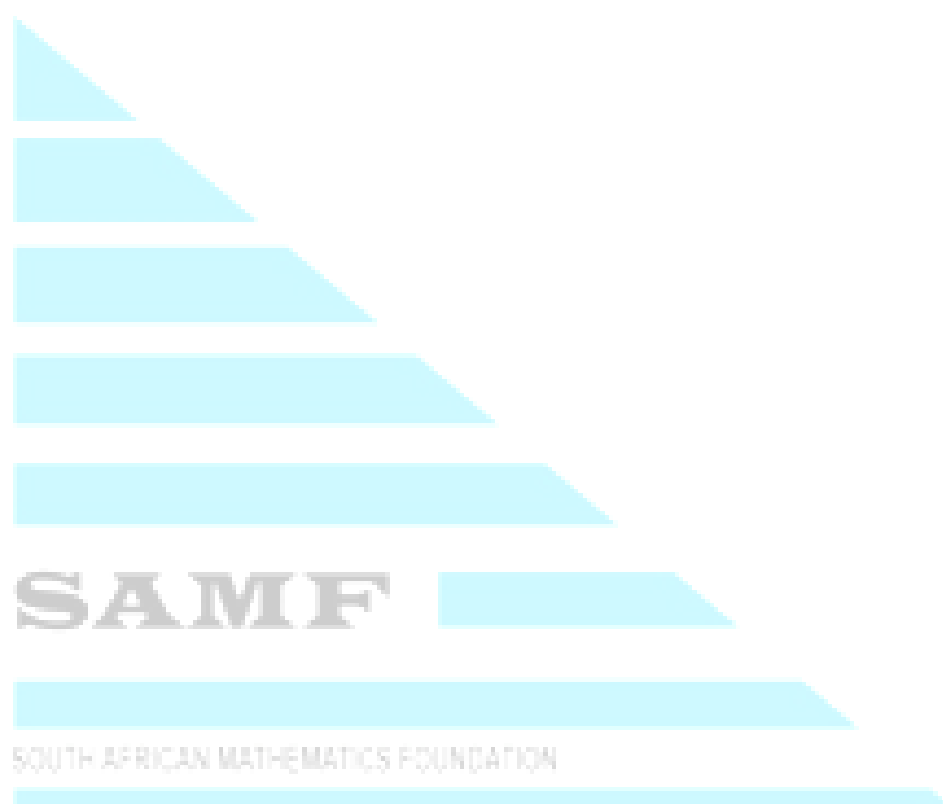
1. The answers to all questions are integers from 0 to 999. Each question has only one correct answer.
2. Scoring rules:
 - 2.1. Each correct answer is worth 3 marks in Part A, 4 marks in Part B and 6 marks in Part C.
 - 2.2. There is no penalty for an incorrect answer or any unanswered question.
3. 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. Start when the invigilator tells you to do so.
7. 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.***

PRIVATE BAG X173, PRETORIA, 0001
TEL: (012) 392-9372 Email: info@samf.ac.za

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





HOW TO COMPLETE THE ANSWER SHEET

The answers to all questions are integers from 000 to 999. Consider the following example question:

21. If $3x - 216 = 0$, determine the value of x .

The answer is 72, so you must complete the block for question 21 on the answer sheet as follows: shade 0 in hundreds row, 7 in the tens row, and 2 in the units row:

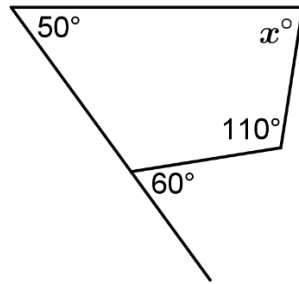
21	H / H	0	<input checked="" type="radio"/>	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	T / T	7	①	②	③	④	⑤	⑥	<input checked="" type="radio"/>	⑧	⑨	
	U / E	2	①	<input checked="" type="radio"/>	③	④	⑤	⑥	⑦	⑧	⑨	

Write the digits of your answer in the the blank blocks on the left of the respective rows, as shown in the example; hundreds, tens and units from top to bottom. The three digits that you wrote down will not be marked, since it is only for your convenience — only the shaded circles will be marked.

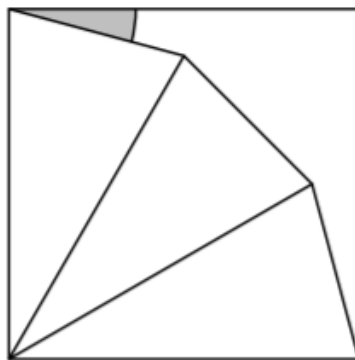
PLEASE DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO

Part A: 3 marks each

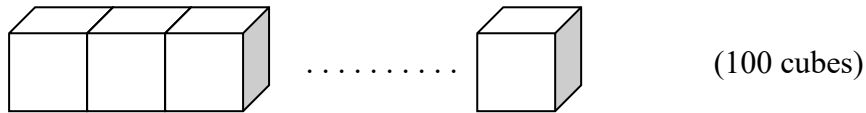
1. The diagram shows four straight-line segments. Determine the value of x .



2. In how many ways can you arrange the letters AAYYY so that the sequence reads the same backwards and forwards?
3. A and B are whole numbers such that $A \times B = 200$. If neither A or B is divisible by 10, what is the value of $A + B$?
4. Which whole number is closest in value to $\frac{0,997^2 \times \sqrt{101}}{5,021}$?
5. A quarter of the square root of a number is 1. What is the number?
6. A rectangle is cut in half to form two squares. Each of these squares has a perimeter of 40 cm. What was the perimeter of the original rectangle in centimetres?
7. A bucket of water weighs 16 kg when completely full. When half the water is poured out, the bucket weighs 11 kg. What is the weight of the bucket, in kg, when empty?
8. Three identical isosceles triangles fit snugly into a square without overlapping, as shown in the diagram. Two of the triangles have edges in common with the square. What is the size in degrees of the shaded angle?



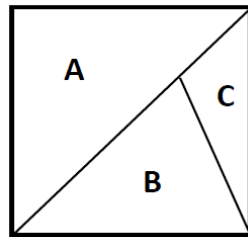
9. The total surface area of a single cube is 12 cm^2 . If 100 such cubes are placed end-to-end as shown, what is the total surface area of the resulting shape (in cm^2)?



10. A man spends a quarter of the money in his wallet. He then gives a third of the remaining money to his children. If he is left with R200, how much money did he have in his wallet at the beginning?

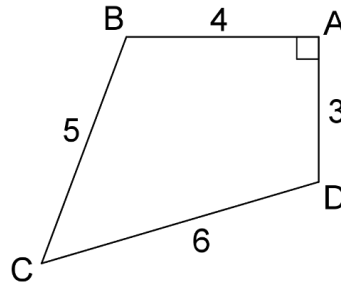
Part B: 4 marks each

11. The diagram shows a square subdivided into three triangles. The ratio of the area of triangle C to the area of triangle A is 1:5. If the area of triangle A is 10 square units, what is the area of triangle B?



12. 10 soccer teams play in a league. Each team plays every other team once during a season. How many soccer matches are there in a season?
13. The size of the four angles in a quadrilateral are in the ratio 1:2:3:4. What is the size of the largest angle in degrees?
14. How many integers between 1000 and 2000 have exactly three '1' digits in them?
15. If $\frac{a}{b} = 6$, $\frac{b}{c} = \frac{1}{4}$ and $a + c = 30$, then determine the value of b .
16. The integers p and q are such that $p \div q = 3,75$. When p is divided by q the remainder is 9. What is the value of p ?
17. In a group of six pupils, two have brown eyes, two have blue eyes, and two have green eyes. From these six pupils, in how many ways could you choose a group of three pupils such that none of them has the same eye colour?

18. Determine the area of quadrilateral ABCD.



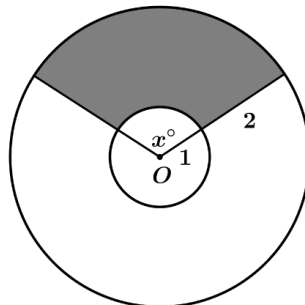
19. A multiple choice test consists of 50 questions. Each correct answer is worth 2 marks, and 1 mark is deducted for each incorrect answer. A pupil scored 55 marks for the test. If no questions were left unanswered, how many questions were answered correctly?
20. Three different prime numbers, a , b and c , are each smaller than 50. If $a + b$ is odd and $b + c$ is even, what is the greatest possible value of $a + c$?

Part C: 6 marks each

21. The 7-digit number $23a467b$ is divisible by 15. What is the greatest possible difference between a and b ?
22. A shop owner buys an item for R60 and puts it on display in his shop. When a customer buys the item they are given a 20% discount on the marked price. If the shop owner wants to make a 20% profit on the item, what figure (in rands) should appear on the price tag?
23. If the following statement contains more than 50 fractions in total, what is the minimum number of fractions needed to make the statement true?

$$\frac{1}{5} + \frac{1}{5} + \cdots + \frac{1}{5} = \frac{1}{7} + \frac{1}{7} + \cdots + \frac{1}{7}$$

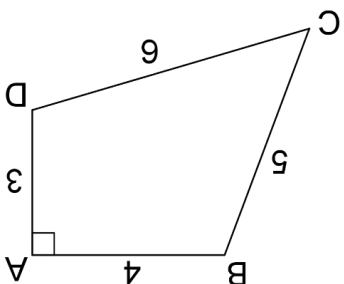
24. Point O is the centre of both circles. If the shaded area is one third of the area of the larger circle, what is the value of x ?



25. Mdu walks at a constant rate. He takes 72 seconds to walk up an escalator which is moving downwards, and 36 seconds to walk down the same escalator. If the escalator is switched off, how many seconds would it take him to walk up or down?

18.

Bepaal die oppervlakte van vierhoek ABCD.



19.

'n Meervoudige keuse toets bestaan uit 50 vrae. Elke korrekte antwoord is 2 punte werd, en vir elke verkeerde antwoord word 1 punt afgetrek. 'n Leerder kry 55 punte vir die toets. As al die vrae beantwoord word, hoeveel vrae is korrek geantwoord?

20.

Drie verskillende priemgetalle, a , b en c , is elkeen kleiner as 50. As $a + b$ onewe is en $b + c$ is ewe, wat is die grootste moontlike waarde van $a + c$?

Afdeling C: 6 punte elk

21.

Die 7-syfer getal $23a467b$ is deelbaar deur 15. Wat is die grootste moontlike verskil tussen a en b ?

22.

'n Winkelienaar koop 'n item vir R60 en vertoon dit in die winkel. Wanneer 'n klient die item koop, kry sy afslag van 20% op die gemerkte prys. As die winkelienaar 'n wins van 20% op die item wil maak, watter bedrag (in rand) moet op die prys-etiket wees?

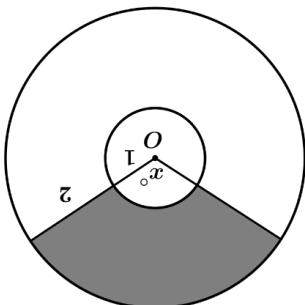
23.

As die volgende stelling meer as 50 breuke in totaal bevat, wat is die minimum aantal breuke wat nodig is om die stelling waar te maak?

$$\frac{1}{5} + \frac{1}{5} + \dots + \frac{5}{1} = \frac{5}{1} + \frac{1}{1} + \frac{7}{1} + \dots + \frac{7}{1}$$

24.

Punt O is die middelpunt van albei sirkels. As die ingekleurde oppervlakte aan een derde van die oppervlakte van die groter sirkel gelyk is, wat is die waarde van x ?

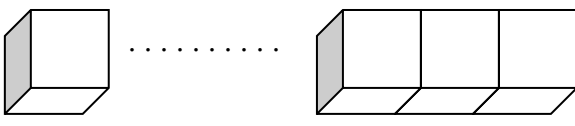


25.

Mdu stap teen 'n konstante tempo. Hy neem 72 sekondes om teen 'n roltrap op te stap, terwyl die roltrap afwaarts beweeg. Hy neem 36 sekondes om met dieselfde roltrap af te stap. As die roltrap afgeskakel word, hoeveel sekondes gaan hy neem om op of af te stap?

9.

Die buite-oppervlakte van 'n enkele kubus is 12 cm^2 . Eenhonderd identiese kubusse word langs mekaar geplaas, soos in die skets. Wat is die totale buite-oppervlakte van die nuwe vorm wat so gemaak word (in cm^2)?



(100 kubusse)

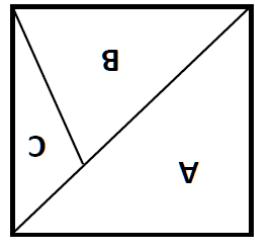
10.

'n Man spandeer 'n kwart van die geld in sy beursie. Hy gee dan 'n derde van die oorblywende geld vir sy kinders. As hy R200 oorhou, hoeveel geld het hy in sy beursie aan die begin gehad?

Afdeling B: 4 punte elk

11.

Die skets toon 'n vierkant wat onderverdeel is in drie driehoeke. Die oppervlakte van driehoek C en die oppervlakte van driehoek A is in die verhouding 1:5. As die oppervlakte van driehoek A 10 vierkante eenhede is, wat is die oppervlakte van driehoek B?



12.

10 sokkerspanne speel in 'n liga. Gedurende 'n seisoen speel elke span een keer teen elke ander span. Hoeveel sokkerwedstryde is daar in 'n seisoen?

13.

Die groottes van die vier hoeke in 'n vierhoek is in die verhouding 1:2:3:4. Wat is die grootte van die grootste hoek in grade?

14.

Hoeveel heelgetalle tussen 1000 en 2000 bevat presies drie syfers '1's?

15.

As $\frac{a}{b} = 6$, $\frac{c}{b} = \frac{1}{4}$ en $a + c = 30$, bepaal die waarde van b .

16.

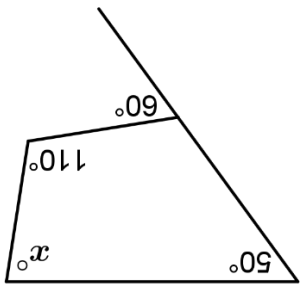
Die heelgetalle p en q is so dat $p \div q = 3,75$. Wanneer p gedeel word deur q , dan is die res 9. Wat is die waarde van p ?

17.

In 'n groep van ses leerders het twee bruin oë, twee het blou oë en twee het groen oë. Op hoeveel maniere kan jy, uit hierdie ses leerders, 'n groep van drie leerders kies sodat nie een van die drie dieselfde kleur oë het nie?

Afdeling A: 3 punte elk

1. Die figuur toon vier reguitlynsegmente. Bepaal die waarde van x .



2. Op hoeveel maniere kan jy die letters AAYYY rangskik sodat die ry dieselfde lees van voor en van agter?

3. A en B is telgetalle sodat $A \times B = 200$. Nie een van A of B is deelbaar deur 10 nie. Wat is die waarde van $A + B$?

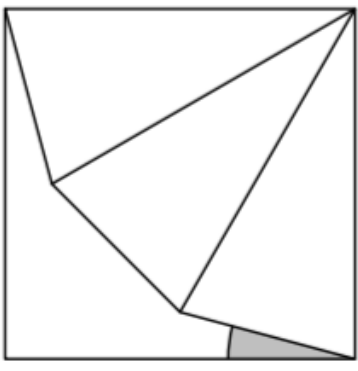
4. Watter telgetal is die naaste in waarde aan $\frac{0,997^2 \times \sqrt{101}}{5,021}$?

5. 'n Kwart van die vierkantswortel van 'n getal is 1. Wat is die getal?

6. 'n Reghoek word in die helfte gesny om twee vierkante te vorm. Elkeen van hierdie vierkante het 'n omtrek van 40 cm. Wat is die omtrek van die oorspronklike reghoek in sentimeters?

7. 'n Emmer water weeg 16 kg wanneer dit heeltemal vol is. As die helfte van die water uitgegooi word, weeg die emmer 11 kg. Bepaal die gewig van die emmer, in kg, wanneer dit leeg is.

8. Drie identiese gelykbenige driehoeke pas presies binne-in 'n vierkant sonder om oor mekaar te lê, soos in die diagram aangetoon. Twee van die driehoeke het 'n sy gemeenskaplik met die vierkant. Wat is die grootte (in grade) van die ingekleurde hoek?



HOE OM DIE ANTWOORDBLAD TE VOLTOOI

Die antwoorde van al die vrae is heelgetalle van 000 tot 999. Beskou die volgende voorbeeldvraag:

21. As $3x - 216 = 0$, bepaal die waarde van x .

Die antwoord is 72, en dus moet jy die blok vir vraag 21 op die antwoordblad as volg voltooi: kleur 0 in die honderde-ry, 7 in die tiene-ry, en 2 in die ene-ry:

21	H/H	0	1	2	3	4	5	6	7	8	9
	T/T	7	0	1	2	3	4	5	6	8	9
	U/E	2	0	1	3	4	5	6	7	8	9

Skryf die syfers van jou antwoord in die lee blokkies aan die linkerkant van elke betrokke ry soos aangetoon in die; honderde, tiene en ene van bo na onder. Die drie syfers wat jy neerskryf word nie gemerk nie omdat dit slegs vir jou eie gerief is — slegs die ingekleurde sirkels word gemerk.

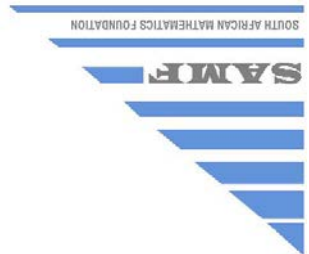
MOET ASSEBLIEF NIE OMBLAAI VOORDAT JY
GEVRA WORD OM DIT TE DOEN NIE

SOUTH AFRICAN MATHEMATICS FOUNDATION

SAMF

DIE OLD MUTUAL SUID-AFRIKAANSE WISKUNDE-OLIMPIADE

Georganiseer deur die
SOUTH AFRICAN MATHEMATICS FOUNDATION



2022 TWEDE RONDTE JUNIOR AFDELING: GRAAD 8 & 9

12 Mei 2022 Tyd: 120 minute Aantal vrae: 25

Instrukties

1. Die antwoorde op al die vrae is heeltal van 0 tot 999. Elke vraag het slegs een korrekte antwoord.
2. Punttoekennings:
 - 2.1. Elke korrekte antwoord tel 3 punte in Afdeling A, 4 punte in Afdeling B en 6 punte in Afdeling C.
 - 2.2. Geen punte word afgetrek vir foutiewe antwoorde of onbeantwoorde vrae nie.
3. Gebruik 'n HB potlood. Papier vir rofwerk, 'n lintiaal 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. Begin sodra die toesighouer die teken gee.
7. 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.

PRIVAATSAK X173, PRETORIA, 0001
TEL: (012) 392-9372 E-pos: info@samf.ac.za

Organisasies betrokke: AMESA, SA Wiskundevereniging,
SA Akademie vir Wetenskap en Kuns

