

SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2018 SECOND ROUND JUNIOR SECTION: GRADE 8 & 9

16 May 2018

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 5 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
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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 0 to 999. Consider the following **example question**:

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

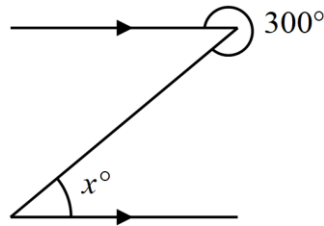
The answer is 72, so you must complete the block for question 26 on the answer sheet as follows: shade 0 in the hundreds row, 7 in the tens row, and 2 in the units row:

21	H / H	0	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	T / T	7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	U / E	2	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

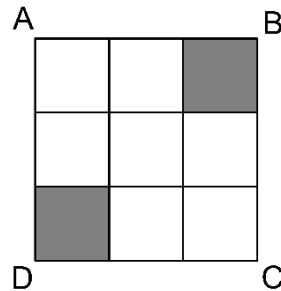
Write the digits of your answer in the blank blocks on the left of the respective rows, as shown in the example; hundreds, tens and units from top to bottom. The three digits that you write down will not be marked, since it is only for your convenience - only the shaded circles will be marked.

Part A: 3 marks each

1. What is the last digit of 2018×8012 ?
2. Determine the value of $2^0 + 1^8$.
3. If $100 \div 5 = 4 \times A$ then find the value of A.
4. Determine the value of x .

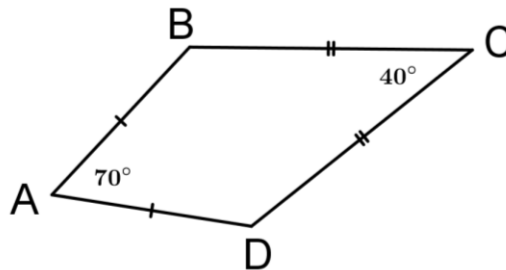


5. ABCD is a square with area 72 cm^2 . ABCD is split into 9 identical squares. What is the shaded area in cm^2 ?

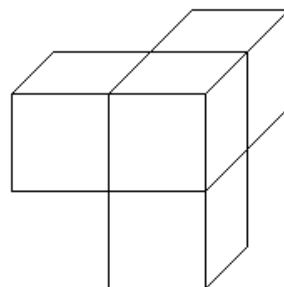


Part B: 4 marks each

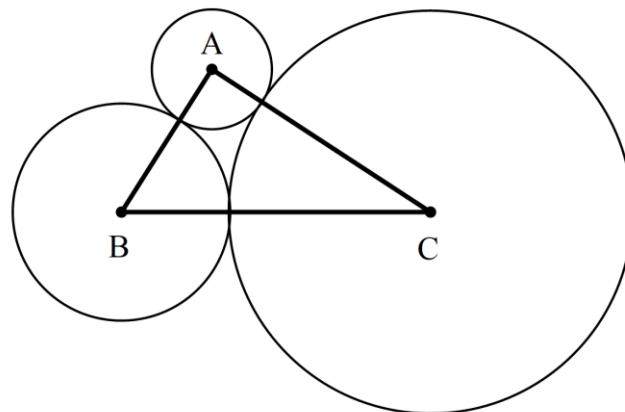
6. The diagram shows kite ABCD. What is the size of \widehat{ABC} in degrees?



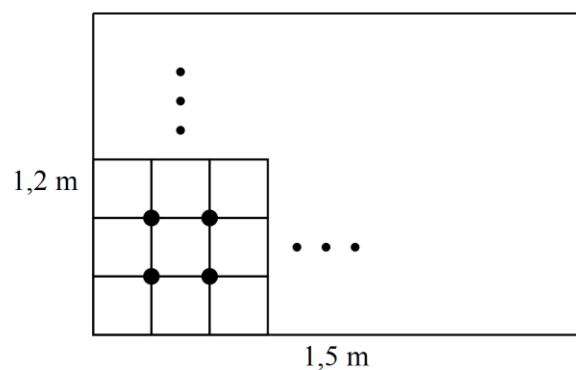
7. The solid shown was made by gluing together four identical cubes each with side length 1 cm. What is the total surface area of the solid in cm^2 ?



8. The sum of four consecutive whole numbers is 2018. Find the smallest of these numbers.
9. In the expression $W \times X^Y - Z$, the values of W , X , Y and Z are 2, 0, 1 and 8, but not necessarily in that order. What is the maximum possible value of $W \times X^Y - Z$?
10. Sanjeev gets the disease *algebritis* and must take one green pill and one pink pill each day for three weeks. A green pill costs R1 more than a pink pill. Sanjeev's pills cost R2121 for the three weeks. How many rands does a green pill cost?
11. How many 2-digit odd numbers can be made using the digits 1, 2, 3, 4, 5, 6, 7, 8 if each digit can be used only once in a given number?
12. The six angles of two different triangles are listed from largest to smallest. The two smallest angles have been left off the list: 120° , 80° , 65° , 37° , ____, ____. In degrees, what is the last angle on the list?
13. The vertices of a 3-4-5 right-angled triangle ABC are the centres of three circles that just touch each other. If $AB = 3$ cm, $AC = 4$ cm and $BC = 5$ cm, determine the sum of the diameters of the three circles in cm.



14. Skylar is sewing together a rectangular quilt. The quilt is 1,5 metres long and 1,2 metres wide, and is made from square pieces of fabric each measuring 15 cm by 15 cm. At every point where four squares meet, Skylar plans to sew on a bright button. How many buttons will be needed?



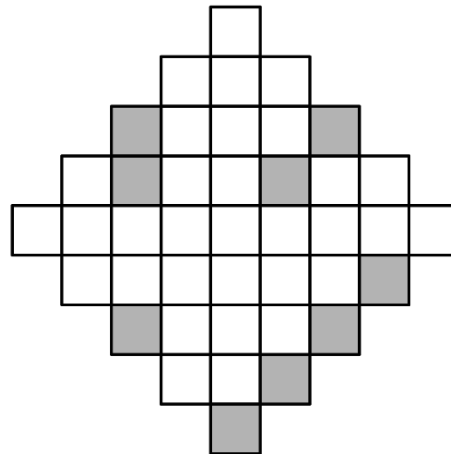
15. In the sum below, each letter represents a different digit. ABC and BCC are 3-digit numbers. What is the digit A?

$$\begin{array}{r} \text{A} \text{ B} \text{ C} \\ + \text{A} \text{ B} \text{ C} \\ \hline \text{B} \text{ C} \text{ C} \end{array}$$

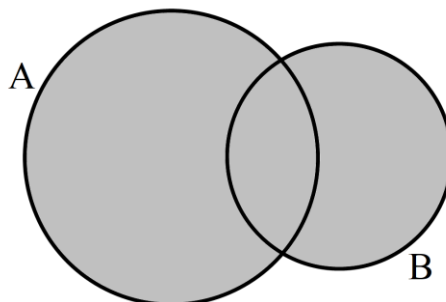
16. The average of v and w is 200. The average of x , y and z is 150. Determine the average of v , w , x , y and z .
17. Some numbers,
when divided by 4, leave a remainder of 3; and
when divided by 3, leave a remainder of 2; and
when divided by 2, leave a remainder of 1.

Determine the smallest such number.

18. The diagram shown contains 41 identical squares. Some of the squares have been shaded. What is the least number of squares that still need to be shaded for the diagram to have a line of symmetry?

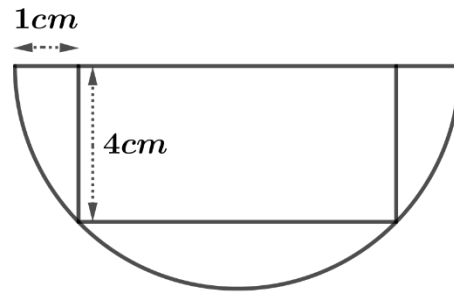


19. Let $\star(x)$ be the sum of the digits of the positive whole number x . For example, $\star(8) = 8$ and $\star(123) = 1 + 2 + 3 = 6$. For how many different 2-digit numbers x is $\star(\star(x)) = 3$?
20. The diagram shows two overlapping circles, A and B. The shaded area is 65 m^2 while the overlapping area is 15 m^2 . The ratio of the area of circle A to the area of circle B is 3:2. By how many m^2 is circle A larger than circle B?

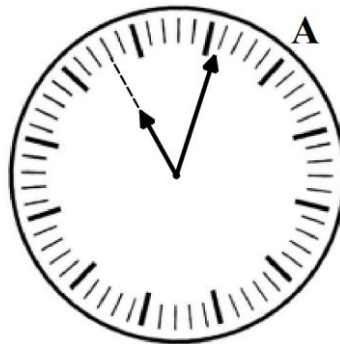


Part C: 5 marks each

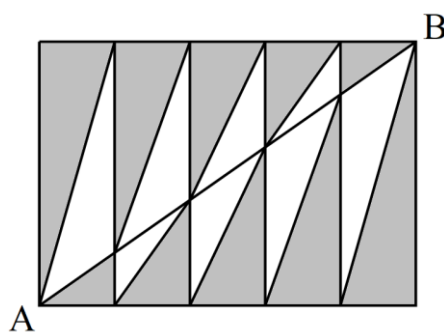
21. The diagram shows a rectangle inside a semicircle. The rectangle just touches the sides of the semicircle. Two lengths are shown. Determine the area of the rectangle in cm^2 .



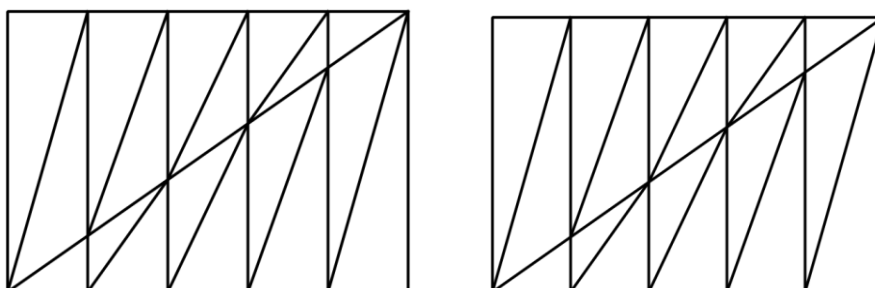
22. Determine the sum of all integers x which satisfy the equation $(218 - x)^{221 + x} = 1$.
23. Tom was jogging at a constant speed of 10 km/h along a straight road. Jerry, jogging at a constant speed of 12 km/h, is 600 m behind Tom. How many minutes will it take Jerry to catch up with Tom?
24. This clock works correctly but the numbers are missing and the clock has been rotated. Use the positions of the hour and minute hands to determine which hour is represented by the letter A.



25. A $10 \text{ cm} \times 6 \text{ cm}$ rectangle is divided into five smaller rectangles of $2 \text{ cm} \times 6 \text{ cm}$. Diagonal AB is drawn, as well as a number of smaller diagonals. How much larger, in cm^2 , is the shaded area than the unshaded area?

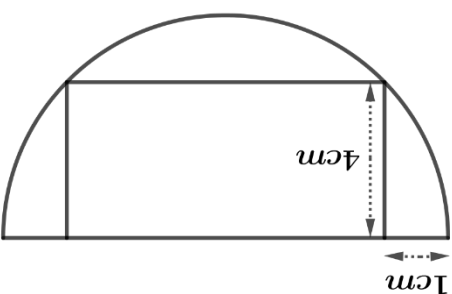


For working if needed:



Deel C: 5 punte elk

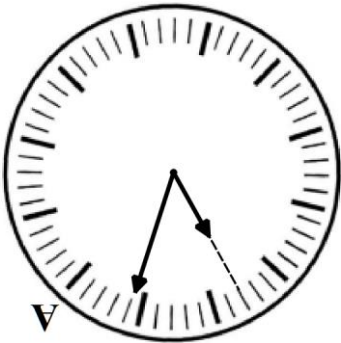
21. Die diagram toon 'n reghoek binne in 'n halfsirkel aan. Die reghoek raak aan die sye van die halfsirkel. Twee lengtes word aangetoon. Bepaal die oppervlakte van die reghoek in cm^2 .



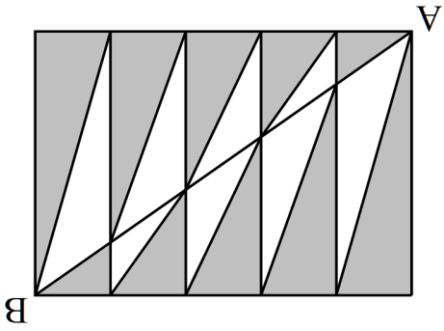
22. Bepaal die som van al die heelgetalle x wat die vergelyking $(218 - x)^{221} + x = 1$ bevredig.

23. Tom draf langs 'n reguit pad teen 'n konstante spoed van 10 km/h . Jerry wat teen 'n konstante spoed van 12 km/h draf, is 600 m agter Tom. Hoeveel minute sal dit vir Jerry neem om Tom in te haal?

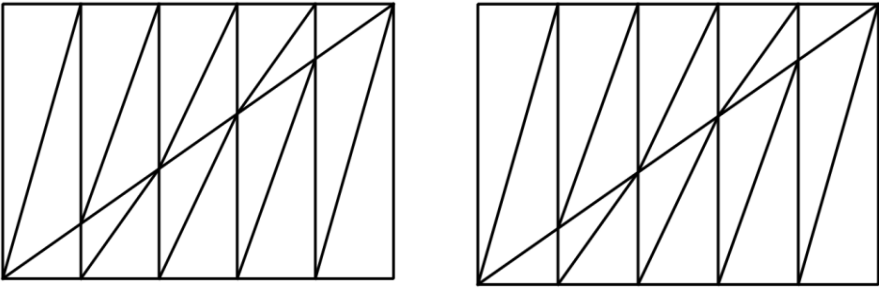
24. Hierdie horlosie werk korrek, maar die syfers is wegelaat en die horlosie is geroeteer. Gebruik die posisies van die uur- en minuutwyser om te bepaal watter uur deur die letter A voorgestel word.



25. 'n $10 \text{ cm} \times 6 \text{ cm}$ reghoek is in vyf kleiner reghoeke van $2 \text{ cm} \times 6 \text{ cm}$ verdeel. Die diagonaal AB, sowel as 'n aantal kleiner diagonale is getrek. Hoeveel groter, in cm^2 , is die ingekleurde oppervlakte as die oppervlakte wat nie ingekleur is nie?



Vir bewerkings indien benodig:



15. In die som hieronder verteenwoordig elke letter 'n ander syfer. ABC en BCC is 3-syfer getalle. Bepaal die waarde van syfer A.

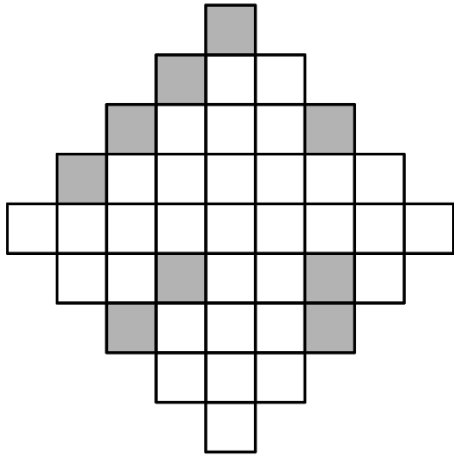
$$\begin{array}{r} A \quad B \quad C \\ + \quad A \quad B \quad C \\ \hline B \quad C \quad C \end{array}$$

16. Die gemiddeld van v en w is 200. Die gemiddeld van x , y en z is 150. Bepaal die gemiddeld van v , w , x , y en z .

17. Sommige getalle,

wanneer gedeel word deur 4, laat 'n res van 3; en
 wanneer gedeel word deur 3, laat 'n res van 2; en
 wanneer gedeel word deur 2, laat 'n res van 1.

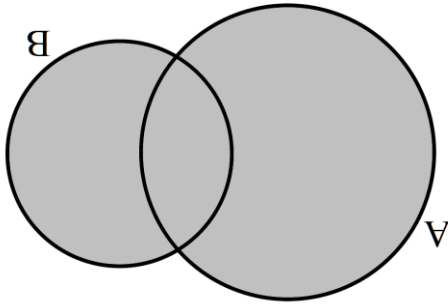
Bepaal die kleinste van hierdie getalle.



18. Die diagram hierlangs aangetoon bestaan uit 41 identiese vierkante. Sommige van die vierkante is ingekleur. Wat is die kleinste getal vierkante wat nog ingekleur moet word sodat die diagram 'n simmetrie-lyn het?

19. Laat $\clubsuit(x)$ die som van die syfers van die positiewe heelgetal x wees. Byvoorbeeld, $\clubsuit(8) = 8$ en $\clubsuit(123) = 1 + 2 + 3 = 6$. Vir hoeveel verskillende 2-syfer getalle x is $\clubsuit(\clubsuit(x)) = 3$?

20. Die diagram toon twee oorvleuelende sirkels, A en B aan. Die ingekleurde oppervlakte is 65 m^2 , terwyl die oorvleuelende oppervlakte 15 m^2 is. Die verhouding van die oppervlakte van sirkel A tot die oppervlakte van sirkel B is 3:2. Met hoeveel m^2 is sirkel A groter as sirkel B?



8. Die som van vier opeenvolgende positiewe heelgetalle is 2018. Bepaal die kleinste van hierdie getalle.

9. In die uitdrukking $W \times X^Y - Z$ is die waardes van W, X, Y en Z gelyk aan 2, 0, 1 en 8, maar nie noodwendig in hierdie volgorde nie.

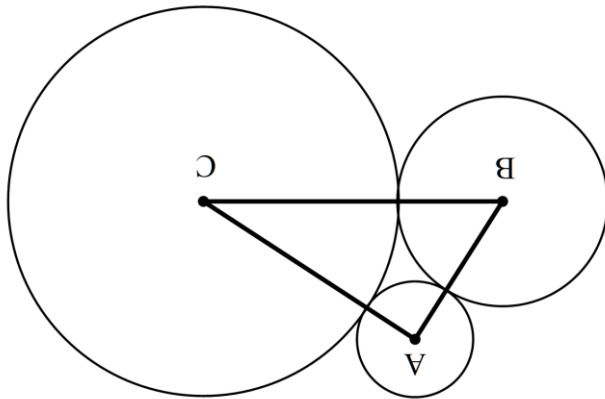
Wat is die maksimum moontlike waarde van $W \times X^Y - Z$?

10. Sanjeev kry die siekte *algebritis* en moet vir drie weke lank elke dag een groen pil en een pink pil drink. 'n Groen pil kos R1 meer as 'n pink pil. Sanjeev se pille kos R2121 vir die drie weke. Hoeveel rand kos een groen pil?

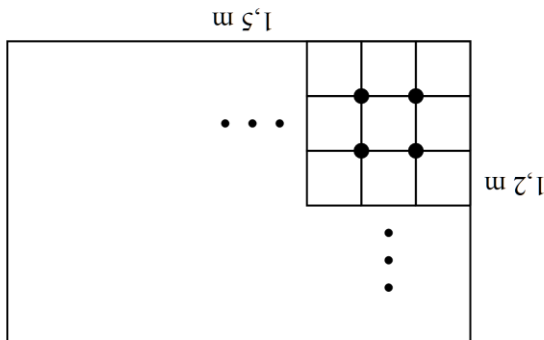
11. Hoeveel 2-syfer onewe getalle kan gevorm word deur die syfers 1, 2, 3, 4, 5, 6, 7, 8 te gebruik, as elke syfer slegs een keer in 'n spesifieke getal gebruik kan word?

12. Die ses hoeke van twee verskillende driehoeke word van die grootste tot die kleinste nergeskryf. Die twee kleinste hoeke is weggelaat van die lys: 120°, 80°, 65°, 37°, —, —. In grade, wat is die laaste hoek in die lys?

13. Die hoeke van 'n 3-4-5 reghoekige driehoek ABC is die middelpunte van drie sirkels wat almal mekaar net raak. As $AB = 3$ cm, $AC = 4$ cm en $BC = 5$ cm, bepaal die som van die deursnee van die drie sirkels in cm.



14. Skylar werk 'n reghoekige lappieskombers aanmekaar. Die lappieskombers is 1,5 meter lank en 1,2 meter breed, en is gemaak van vierkantige stukkie materiaal wat elk 15 cm by 15 cm groot is. Skylar beplan om by elke punt waar vier vierkante ontmoet, 'n helder knoop vas te werk. Hoeveel knope word benodig?



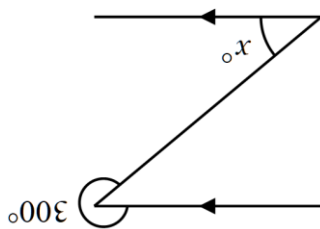
Deel A: 3 punte elk

1. Wat is die laaste syfer van 2018×8012 ?

2. Bepaal die waarde van $2^0 + 1^8$.

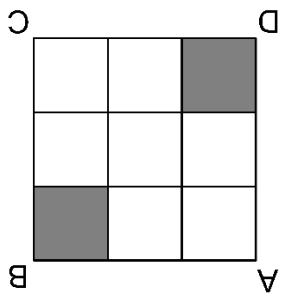
3. As $100 \div 5 = 4 \times A$, bepaal die waarde van A.

4. Bepaal die waarde van x.



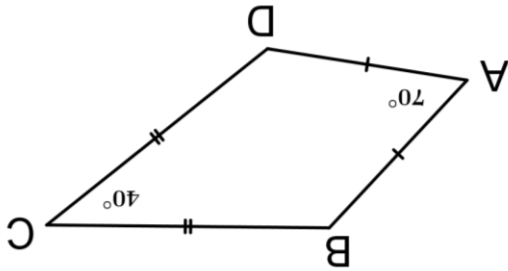
5.

ABCD is 'n vierkant met oppervlakte 72 cm^2 . ABCD is verdeel in 9 identiese vierkante. Bepaal die gekleurde oppervlak in cm^2 .



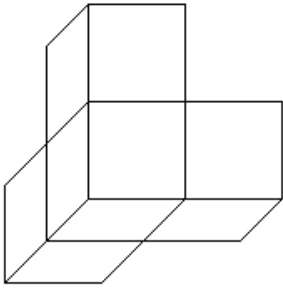
Deel B: 4 punte elk

6. Die diagram toon vlieër ABCD. Bepaal die grootte van \widehat{ABC} in grade.



7.

Die vaste liggaam, hierlangs aangetoon, is gevorm deur vier identiese kubusse, elk met sylengete 1 cm, aanmeekaar te gom. Wat is die totale buite-oppervlakte van die vaste liggaam in cm^2 ?



HOE OM DIE ANTWOORDBLAD TE VOLTTOOI

Die antwoorde op al die vrae is heelgetalle van 0 tot 999. Beskou die volgende voorbeeldvraag:

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

Die antwoord is 72. Volttooi die blok vir vraag 26 op die antwoordblad soos volg: Die antwoorde op al die vrae is heelgetalle van 0 tot 999. Beskou die volgende voorbeeldvraag:

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

Skryf die syfers van jou antwoord in die oop spasies aan die linkerkant van elke ry in, soos in die voorbeeld aangetoon: honderde, tiene en ene van bo na onder. Die drie syfers wat jy neergeskryf het, word nie nagesien nie omdat dit slegs vir jou eie gerief is – slegs die ingekleurde sirkeltjies word nagesien.

2018 TWEDE RONDTE JUNIOR AFDELING: GRAAD 8 & 9

16 Mei 2018 Tyd: 120 minute Aantal vrae: 25

Instrukties

1. Die antwoorde op al die vrae is heelgetalle van 0 tot 999. Elke vraag het slegs een korrekte antwoord.
2. Puntetoekenning:
 - 2.1. Elke korrekte antwoord tel 3 punte in Afdeling A, 4 punte in Afdeling B en 5 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 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. 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.*



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Organisasies betrokke: AMESA, SA Wiskundevereniging,
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