SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2018 FIRST ROUND
SENIOR SECTION: GRADE 10 - 12

14 March 2018 **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. *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.

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

1. Which of the following numbers is the largest?

(A) 4.04 (B) 4.004 (C) 4.4 (D) 4.44 (E) 4.044

2. If $x + 70 = 9 \times 8$, what is the value of x?

(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

3. Which one of the following numbers can be written as the sum of two prime numbers?

(A) 11 (B) 15 (C) 17 (D) 23 (E) 29

4. An aeroplane is flying at 720 km/h. How many metres does it fly in one second?

(A) 100 (B) 125 (C) 150 (D) 200 (E) 250

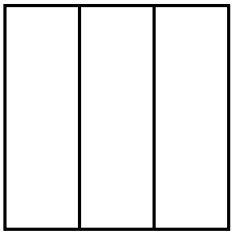
5. If $abc = 1$, $bde = 0$ and $ace = 0$, which of the following variables must be zero?

(A) a (B) b (C) c (D) d (E) e

6. The sides of a triangle are in the ratio $3 : 4 : 5$. If the sum of the sides is 60, then the shortest side is

(A) 5 (B) 15 (C) 20 (D) 25 (E) 35

7. The square in the figure is made up of three identical rectangles, each with a perimeter of 24 cm. What is the area of the square in cm^2?

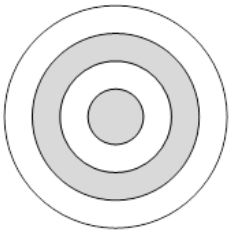


(A) 36 (B) 49 (C) 64 (D) 81 (E) 144

8. Let n and p be integers greater than 1. If $12n$ is the square of a natural number and $75np$ is the cube of a natural number, then the smallest value for $n+p$ is

(A) 12 (B) 18 (C) 23 (D) 27 (E) 42

9. The radii of the concentric circles (circles with the same centre, but different radii) in the target are 1, 2, 3 and 4 cm respectively. If a dart hitting the target is equally likely to hit it anywhere, what is the probability that it will land in the small shaded circle in the middle?



(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{9}$ (E) $\frac{1}{16}$

10. Harry inflates eight balloons every three minutes. Every tenth balloon bursts immediately after it has been inflated, while all the other balloons remain inflated. How many inflated balloons will Harry have after two hours?

(A) 160 (B) 216 (C) 240 (D) 288 (E) 320

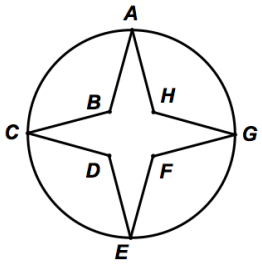
11. Michael bought 9 soft and hard sweets. Soft sweets cost R3 each and hard sweets cost R2 each. If Michael spent a total of R22 then how many soft sweets did he buy?

(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

12. For how many integer values of n will the value of the expression $4n-5$ be an integer greater than 1 and less than 200?

(A) 47 (B) 48 (C) 49 (D) 50 (E) 51

13. The star-shaped octagon $ABCDEFGH$ is symmetrical and the centre of the star is at the centre of the circle. If $A\widehat{H}G = 110°$, then $B\widehat{A}H$ is, in degrees, equal to



(A) 15 (B) 20 (C) 25 (D) 30 (E) 35

14. One side of a triangle has length 8 and a second side has length 5. Which of the following could be the area of the triangle?

I 5
II 20
III 24

(A) I only (B) II only (C) III only (D) I and II only (E) I, II and III

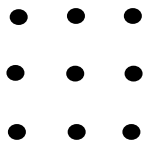
15. Considering the positions on the number line given, which of the following could be a value for x?

(A) $\frac{5}{3}$ (B) $\frac{3}{5}$ (C) $-\frac{3}{5}$ (D) $-\frac{5}{3}$ (E) none of these

16. In Kitty's town, 10% of the dogs think they are cats and 10% of the cats think they are dogs. All the other cats know that they are cats and all the other dogs know that they are dogs. In total, 20% of the animals consider themselves to be cats. What percentage of the animals are actually cats?

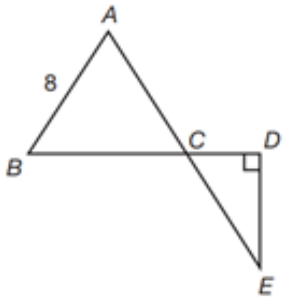
(A) 12.5% (B) 10% (C) 8.5% (D) 15% (E) 16%

17. Nine points lie in a plane as shown. How many choices of three points are there that will form a triangle?



(A) 86 (B) 76 (C) 60 (D) 36 (E) 24

18. Triangle ABC is an equilateral triangle with sides of length 8, and triangle CDE is a right triangle. If the length of AE is 20, what is the length of BD?

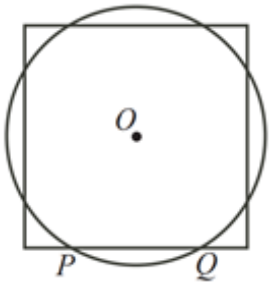


(A) 12 (B) 14 (C) 16 (D) 18 (E) 20

19. In my purse are three R1 coins, two R2 coins and one R5 coin. If I take out three coins at random, what is the probability that I have taken out more than R5?

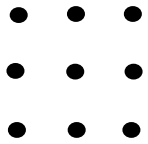
(A) $\frac{1}{6}$ (B) $\frac{1}{20}$ (C) $\frac{37}{60}$ (D) $\frac{1}{3}$ (E) $\frac{1}{2}$

20. In the diagram, the circle and the square have equal areas and the same centre O. The circle has radius 1 and intersects one side of the square at P and Q. What is the length of PQ?



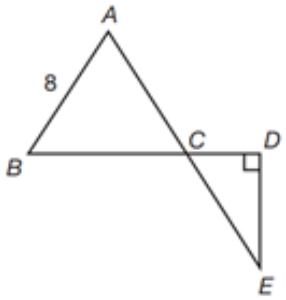
(A) $\sqrt{4-\pi}$ (B) 1 (C) $\sqrt{2}$ (D) $2-\sqrt{\pi}$ (E) $4-\sqrt{\pi}$

17. Nege punte lê in 'n vlak soos aangetoon. Op hoeveel maniere kan drie punte gekies word om elke keer 'n driehoek te vorm?



(A) 86 (B) 76 (C) 60 (D) 36 (E) 24

18. Driehoek ABC is 'n gelyksydige driehoek met sylengtes 8, en driehoek CDE is 'n reghoekige driehoek. As die lengte van AE gelyk is aan 20, wat is die lengte van BD?

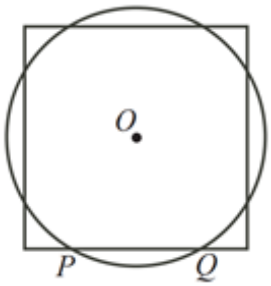


(A) 12 (B) 14 (C) 16 (D) 18 (E) 20

19. In my beursie is drie R1-muntstukke, twee R2-muntstukke en een R5-muntstuk. As ek drie muntstukke ewekansig uithaal, wat is die waarskynlikheid dat ek meer as R5 uitgehaal het?

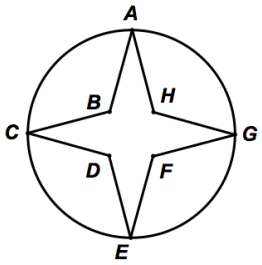
(A) $\frac{1}{6}$ (B) $\frac{1}{20}$ (C) $\frac{37}{60}$ (D) $\frac{1}{3}$ (E) $\frac{1}{2}$

20. In die diagram het die sirkel en die vierkant gelyke oppervlaktes asook dieselfde middelpunt O. Die radius van die sirkel is 1 en die sirkel sny een sy van die vierkant by P en Q. Wat is die lengte van PQ?



(A) $\sqrt{4-\pi}$ (B) 1 (C) $\sqrt{2}$ (D) $2-\sqrt{\pi}$ (E) $4-\sqrt{\pi}$

13. Die stervormige agthoek $ABCDEFGH$ is simmetries en die middelpunt van die ster is by die middelpunt van die sirkel. As $A\widehat{H}G = 110°$, dan is $B\widehat{A}H$, in grade, gelyk aan



(A) 15 (B) 20 (C) 25 (D) 30 (E) 35

14. Een sy van 'n driehoek het 'n lengte van 8 en 'n tweede sy het 'n lengte van 5. Watter van die volgende kan die oppervlakte van die driehoek wees?

I 5
II 20
III 24

(A) slegs I (B) slegs II (C) slegs III (D) slegs I en II (E) I, II en III

15. Beskou die posisies op die gegewe getallelyn. Watter van die volgende kan 'n waarde vir x wees?

(A) $\frac{5}{3}$ (B) $\frac{3}{5}$ (C) $-\frac{3}{5}$ (D) $-\frac{5}{3}$ (E) nie een van hierdie nie

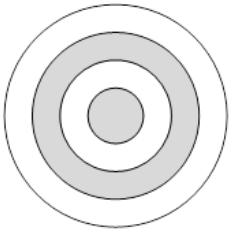
16. In Kittydorp dink 10% van die honde dat hulle katte is en 10% van die katte dink dat hulle honde is. Al die ander katte weet dat hulle katte is en al die ander honde weet dat hulle honde is. In totaal, beskou 20% van die diere hulself as katte. Watter persentasie van die diere is werklik katte?

(A) 12.5% (B) 10% (C) 8.5% (D) 15% (E) 16%

8. Laat n en p heelgetalle groter as 1 wees. As $12n$ die kwadraat van 'n natuurlike getal is en $75np$ die derdemag van 'n natuurlike getal, dan is die kleinste waarde van $n + p$ gelyk aan

(A) 12 (B) 18 (C) 23 (D) 27 (E) 42

9. Die radii van die konsentriese sirkels (sirkels met dieselfde middelpunt, maar met verskillende radii) in die teiken is onderskeidelik 1, 2, 3 en 4 cm. As 'n veerpyltjie wat na die teiken gegooi word, 'n gelyke kans het om dit op enige plek te tref, wat is die waarskynlikheid dat dit in die klein ingekleurde sirkel in die middel sal land?



(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{9}$ (E) $\frac{1}{16}$

10. Harry blaas elke drie minute agt ballonne op. Elke tiende ballon bars onmiddellik nadat dit opgeblaas is, terwyl die ander ballonne opgeblaas bly. Hoeveel opgeblaasde ballonne het Harry na twee uur?

(A) 160 (B) 216 (C) 240 (D) 288 (E) 320

11. Michael het 9 sagte en harde lekkers gekoop. Sagte lekkers kos R3 elk en harde lekkers kos R2 elk. As Michael altesaam R22 betaal het, hoeveel sagte lekkers het hy gekoop?

(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

12. Vir hoeveel heelgetalwaardes van n sal die waarde van die uitdrukking $4n - 5$ 'n heelgetal groter as 1 en kleiner as 200 wees?

(A) 47 (B) 48 (C) 49 (D) 50 (E) 51

1. Watter van die volgende getalle is die grootste?

(A) 4.04 (B) 4.004 (C) 4.4 (D) 4.44 (E) 4.044

2. As $x + 70 = 9 \times 8$, wat is die waarde van x?

(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

3. Watter een van die volgende getalle kan geskryf word as die som van twee priemgetalle?

(A) 11 (B) 15 (C) 17 (D) 23 (E) 29

4. 'n Vliegtuig vlieg teen 720 km/h. Hoeveel meter vlieg dit in een sekonde?

(A) 100 (B) 125 (C) 150 (D) 200 (E) 250

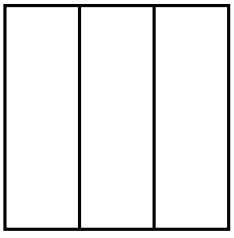
5. As $abc = 1$, $bde = 0$ en $ace = 0$, watter van die volgende veranderlikes moet nul wees?

(A) a (B) b (C) c (D) d (E) e

6. Die sye van 'n driehoek is in die verhouding $3 : 4 : 5$. As die som van die sye gelyk is aan 60, dan is die kortste sy gelyk aan

(A) 5 (B) 15 (C) 20 (D) 25 (E) 35

7. Die vierkant in die figuur bestaan uit drie identiese reghoeke wat elkeen 'n omtrek van 24 cm het. Wat is die oppervlakte van die vierkant in cm^2?



(A) 36 (B) 49 (C) 64 (D) 81 (E) 144

SUID-AFRIKAANSE WISKUNDE-OLIMPIADE

Georganiseer deur die
SOUTH AFRICAN MATHEMATICS FOUNDATION

2018 EERSTE RONDTE
SENIOR AFDELING: GRAAD 10-12

14 Maart 2018 **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. *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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