

OLD MUTUAL SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2022 FIRST ROUND JUNIOR SECTION: GRADE 8

10 March 2022 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.***

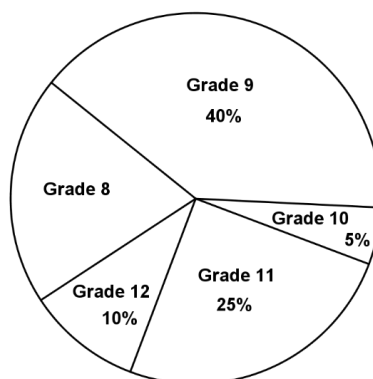
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Organisations involved: AMESA, SA Mathematical Society,
SA Akademie vir Wetenskap en Kuns, ASTEMI

The Mathematics Talent Search is a free online problem-solving course for learners from Gr 7 – 12 presented by the SAMF. All you have to do to participate is to click on <https://mytutor.chat/samf-talent-search/> or to take a photograph of the QR code to go to the MyTutor.chat site easily.



1. $5^2 - 5 \times 2^2 =$
 (A) -75 (B) -10 (C) 5 (D) 20 (E) 80
2. Which one of the following numbers lies between $\frac{1}{10}$ and $\frac{1}{5}$?
 (A) $0,25$ (B) $0,18$ (C) $0,3$ (D) $0,5$ (E) $0,43$
3. $\frac{20 \times 22}{2 \times 0 + 2 \times 2} =$
 (A) 110 (B) 100 (C) 55 (D) 20 (E) 10
4. If $\frac{\sqrt[3]{p}}{3} = 1$, then what is the value of p ?
 (A) 0 (B) 1 (C) 3 (D) 9 (E) 27
5. The digits 1, 2, 3, 5, 7 and 9 are used to create two 2-digit numbers. Each of the digits can only be used once. What is the greatest possible difference between the two 2-digit numbers?
 (A) 58 (B) 64 (C) 85 (D) 88 (E) 90
6. Thabo buys a pizza cut into 6 equal slices. He then cuts each slice into 2 equal smaller pieces. If Thabo eats 4 of these smaller pieces, what fraction of the whole pizza did he eat?
 (A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{3}{8}$ (D) $\frac{1}{2}$ (E) $\frac{2}{5}$
7. The pie chart shows the number of pupils taking part in a singing competition. If there are 30 Grade 8 pupils in the competition, how many pupils are there in total in the competition?

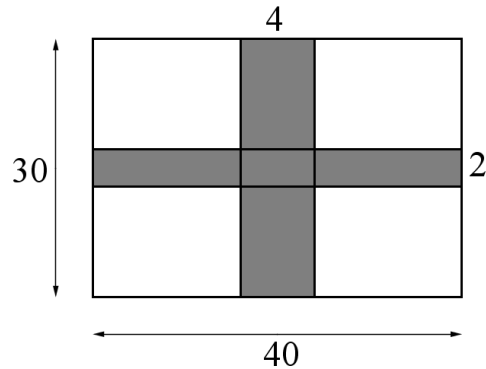


- (A) 20 (B) 120 (C) 150 (D) 280 (E) 300

8. Daniel and Julia have new sticker books. Daniel puts 6 stickers in his book every day and Julia puts 5 stickers in her book every day. How many stickers will Daniel have when Julia has 30 stickers in her book?

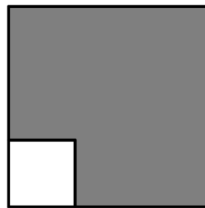
(A) 30 (B) 31 (C) 32 (D) 36 (E) 39

9. Determine the area of the shaded region.



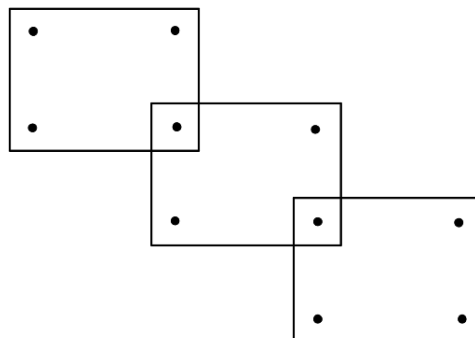
(A) 192 (B) 200 (C) 210 (D) 220 (E) 240

10. The diagram shows a small square nested inside a larger square. The perimeter of the shaded region is 24 units. What is the area of the larger square?



(A) 12 (B) 24 (C) 36 (D) 48 (E) 144

11. A series of postcards are pinned to a board, in a diagonal line, using drawing pins. How many drawing pins would be needed to pin 25 postcards in a similar fashion?

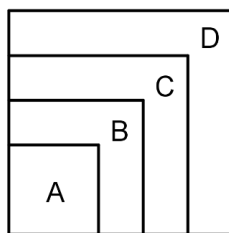


(A) 70 (B) 72 (C) 74 (D) 76 (E) 78

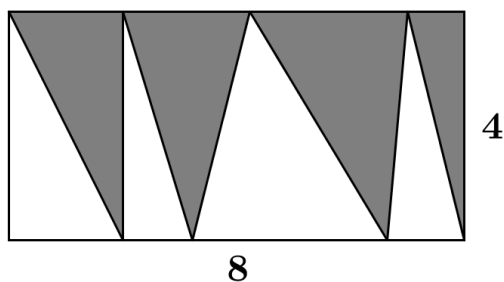
12. If the table is continued in the same way, under which letter would 800 appear?

A	B	C	D	E	F	G
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18

- (A) A (B) B (C) C (D) D (E) E
13. Four nested squares are shown. The four regions labelled A, B, C and D each have the same area. If the smallest square has a side length of 5 units, what is the side length of the largest square?



- (A) 10 (B) 12 (C) 14 (D) 16 (E) 18
14. The rectangle shown has side lengths of 8 and 4. Determine the area of the shaded region.

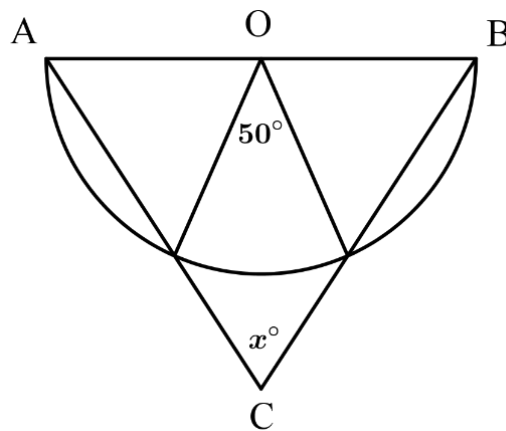


- (A) 8 (B) 10 (C) 12 (D) 14 (E) 16
15. What is the obtuse angle formed by the hands of a clock at 9:10?



- (A) 100° (B) 120° (C) 130° (D) 145° (E) 160°

16. Pravin can work any day of the week. However, for every three days he works he gets the next day off. If he gets a day off on a Monday, after how many days will he next get a day off on a Monday?
- (A) 7 (B) 12 (C) 14 (D) 22 (E) 28
17. What is the smallest number n that would make $792 \times n$ a perfect square?
- (A) 2 (B) 10 (C) 11 (D) 20 (E) 22
18. From a group of 5 people, you want to choose two teams to compete against each other. Each team must have 2 people. In how many ways can you do this?
- (A) 5 (B) 15 (C) 20 (D) 25 (E) 30
19. If Tina cycles at 14 km/h instead of 10 km/h, she would travel 20 km further in the same time. What distance would she travel at 10 km/h?
- (A) 100 km (B) 50 km (C) 30 km (D) 24 km (E) 16 km
20. The diagram shows isosceles triangle ABC with $AC = BC$. Side AB is the diameter of a semi-circle with centre O. Determine the value of x .



- (A) 50° (B) 55° (C) 60° (D) 65° (E) 70°

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:

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

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

$$a \times a \times a \times a \times \dots \times a = a^n \quad (n \text{ factors of } a)$$

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

3.2 Factorial notation:

$$2! = 2 \times 1 = 2$$

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

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

$$1 \times 2 \times 3 \times \dots \times n = n!$$

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

4 Area of a

4.1 triangle is: $\frac{1}{2} \times (\text{base} \times \text{height}) = \frac{1}{2}(b.h)$

4.2 rectangle is: $\text{length} \times \text{width} = lw$
 $\text{length} \times \text{breadth} = lb$

4.3 square is: $\text{side} \times \text{side} = s^2$

4.4 rhombus is: $\frac{1}{2} \times (\text{product of diagonals})$

4.5 trapezium is: $\frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$

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 \times perpendicular height
or area of base \times perpendicular height

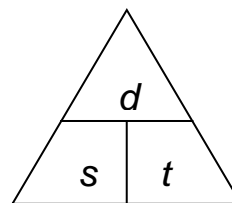
9.2 Surface area of a right prism is: (perimeter of base $\times h$) + ($2 \times$ area of base)

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

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

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

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

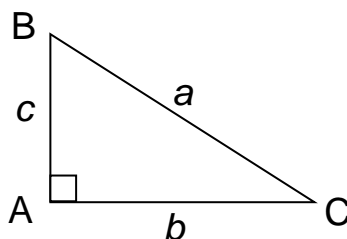


$$d = s \times t$$

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

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

12. Pythagoras:



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

13. Conversions:

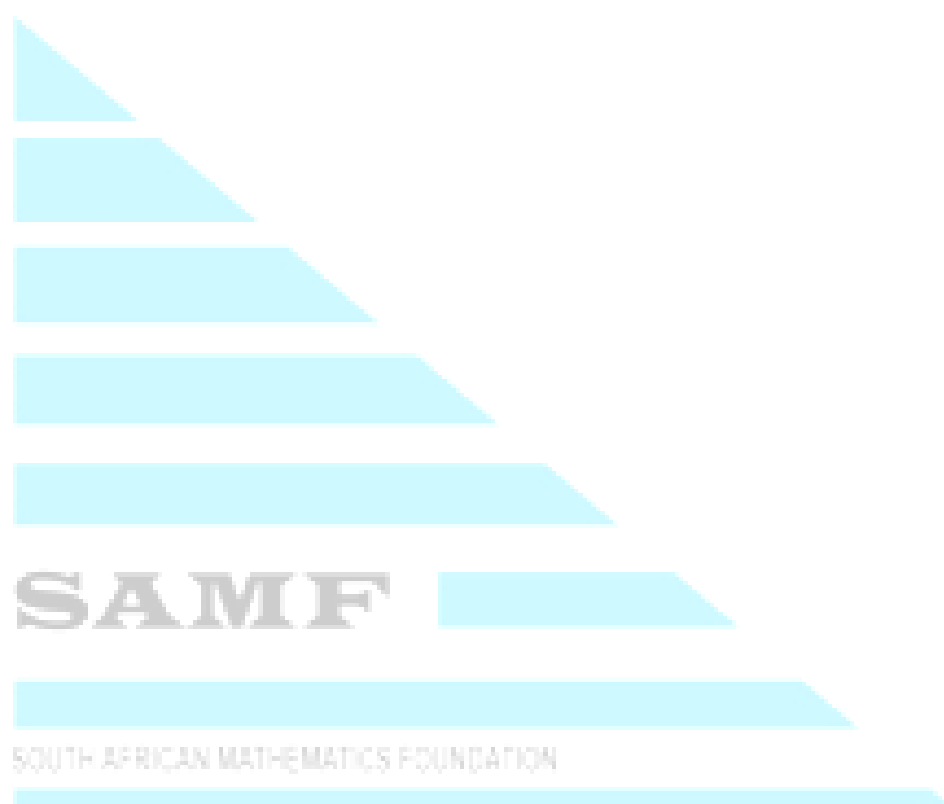
$$1 \text{ cm}^3 = 1 \text{ ml} ;$$

$$1000 \text{ cm}^3 = 1 \ell$$

$$1000 \text{ m} = 1 \text{ km} ;$$

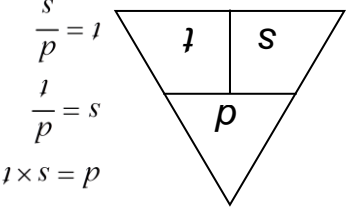
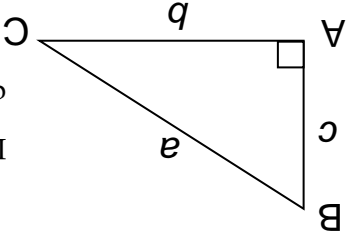
$$1000 \text{ g} = 1 \text{ kg} ;$$

$$100 \text{ cm} = 1 \text{ m}$$



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5.	Buite-oppervlakte van 'n	
5.1	regte prisma is:	$2lb + 2lh + 2bh$ (h = hoogte)
5.2	steer is:	$4\pi r^2$
6	Omtek van 'n:	
6.1	reghoek is:	$2l \times \text{lengte} + 2 \times \text{breedte}$ $2l + 2b$
6.2	vierkant is:	4s
7.	Omtek 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 dwarsnit \times hoogte
	or	
9.2	Buite-oppervlakte van 'n regte prisma is:	(omtek van basis \times h) + (2 \times oppervlakte van basis)
10.	Som van die binnehoeke van 'n veelhoek is:	$180^\circ(n - 2)$ [n = aantal sye]
11.	Afstand is:	spoed \times tyd (d = s \times t)
	Spood =	afstand \div tyd (s = $\frac{d}{t}$)
	Tyd =	afstand \div spoed (t = $\frac{s}{d}$)
		 $d = s \times t$ $t = \frac{s}{d}$ $s = \frac{t}{d}$
12.	Pythagoras:	 <p>Indien $\triangle ABC$ 'n reghoekige driehoek is, dan sal $a^2 = b^2 + c^2$</p>
13.	Omskakelings:	$1000 \text{ m} = 1 \text{ km};$ $1 \text{ cm}^3 = 1 \text{ ml};$ $1000 \text{ cm}^3 = 1 \ell$ $1000 \text{ g} = 1 \text{ kg};$ $100 \text{ cm} = 1 \text{ m}$

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	<p>Eksponeensiële notasie:</p> $2 \times 2 \times 2 \times 2 \times 2 = 2^5$ $3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$ $a \times a \times a \times a \times a \times a \times a = a^7$ <p>(a is die grondtal en n is die indeks (eksponent))</p>
3.2	<p>Fakultei notasie:</p> $2! = 2 \times 1 = 2$ $3! = 3 \times 2 \times 1 = 6$ $4! = 4 \times 3 \times 2 \times 1 = 24$ $1 \times 2 \times 3 \times \dots \times n = n!$
3.3	$1 + 2 + 3 + 4 + \dots + n = n(n + 1)/2$
4	Oppervlakte van 'n:
4.1	driehoek is: $\frac{1}{2} \times (\text{basis} \times \text{loodregte hoogte}) = \frac{1}{2}(b \cdot h)$
4.2	reghoek is: $\text{lengte} \times \text{breedte} = lb$
4.3	vierkant is: $sy \times sy = s^2$
4.4	ruit (rombus) is: $\frac{1}{2}(\text{produk van die diagonale})$
4.5	trapesium is: $\frac{1}{2}(\text{som van ewewydige sye}) \times \text{hoogte}$
4.6	sirkel is: πr^2 (r = radius)

16. Pravin kan enige dag van die week werk. Nogtans, vir elke drie dae wat hy werk, moet hy die volgende dag rus. Indien hy 'n rusdag op 'n Maandag het, na hoeveel dae sal hy weer 'n rusdag op 'n Maandag kry?

(A) 7 (B) 12 (C) 14 (D) 22 (E) 28

17. Wat is die kleinste getal n wat $792 \times n$ 'n volkome vierkant sal maak?

(A) 2 (B) 10 (C) 11 (D) 20 (E) 22

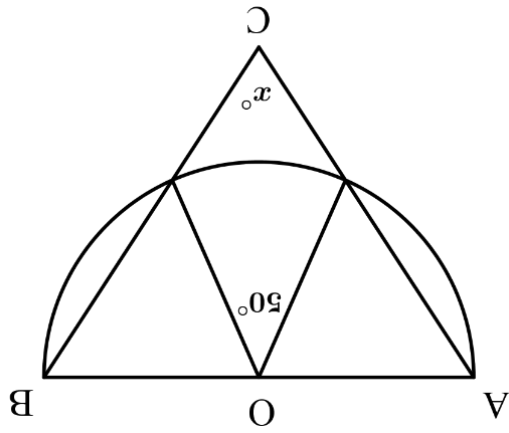
18. Uit 'n groep van 5 mense, wil jy twee spanne kies om teen mekaar deel te neem. Elke span moet 2 lede hê. Op hoeveel maniere kan jy dit doen?

(A) 5 (B) 15 (C) 20 (D) 25 (E) 30

19. As Tina teen 'n spoed van 14 km/h fietsry, sal sy 20 km verder ry, in dieselfde tyd as wanneer sy teen 10 km/h fietsry. Hoe ver sal sy teen 'n spoed van 10 km/h ry?

(A) 100 km (B) 50 km (C) 30 km (D) 24 km (E) 16 km

20. In die figuur is gelykbenige driehoek ABC met $AC = BC$. Sy AB is die middellyn van 'n halfsirkel met middelpunt O. Bepaal die waarde van x .

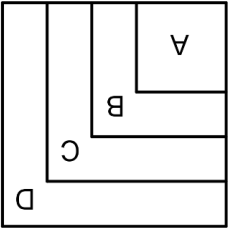


(A) 50° (B) 55° (C) 60° (D) 65° (E) 70°

12. As die tabel verder op hierdie manier voltooi word, onder watter letter (A – G) sal 800 wees?

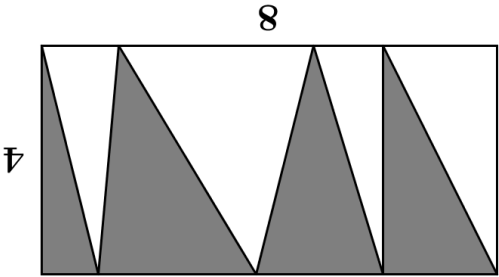
(A) A	(B) B	(C) C	(D) D	(E) E
A	B	C	D	E
1	2	3	4	5
8	9	10	11	12
15	16	17	18	...
...
...
...

13. Vier vierkante wat presies bo-op mekaar pas, word aangetoon. Die vier dele gemerk A, B, C en D het elkeen dieselfde gelyke oppervlakte. As die kleinste vierkant 'n sylengte van 5 eenhede het, wat is die sylengte van die grootste vierkant?



- (A) 10 (B) 12 (C) 14 (D) 16 (E) 18

14. Die reghoek in die diagram het sylengtes van 8 en 4. Bepaal die oppervlakte van die ingekleurde deel.



- (A) 8 (B) 10 (C) 12 (D) 14 (E) 16

15. Bepaal die stomphoek, wat gevorm word deur die arms van 'n horlosie, as dit 9:10 is.

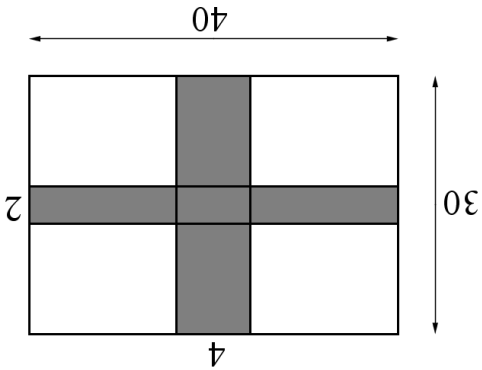


- (A) 100° (B) 120° (C) 130° (D) 145° (E) 160°

8. Daniel en Julia het nuwe plakkertjie. Daniel plak elke dag 6 plakkers in sy boek en Julia plak elke dag 5 plakkers in haar boek. Hoeveel plakkers gaan Daniel hê wanneer Julia 30 plakkers in haar boek het?

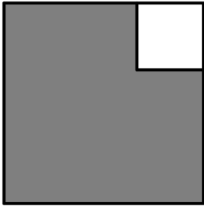
(A) 30 (B) 31 (C) 32 (D) 36 (E) 39

9. Bepaal die oppervlakte van die ingekleurde deel.



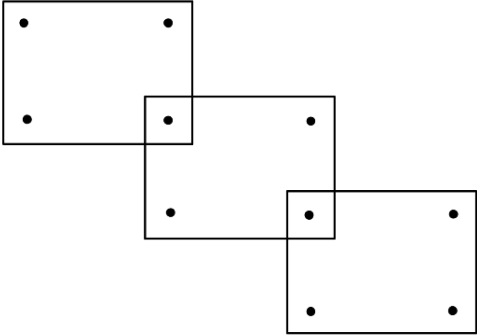
(A) 192 (B) 200 (C) 210 (D) 220 (E) 240

10. Die figuur toon 'n klein vierkant wat presies binne-in 'n groter vierkant pas. Die omtrek van die ingekleurde deel is 24 eenhede. Wat is die oppervlakte van die groter vierkant?



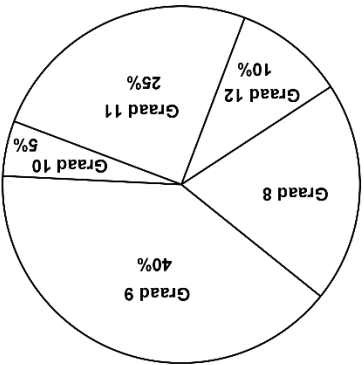
(A) 12 (B) 24 (C) 36 (D) 48 (E) 144

11. 'n Reeks poskaarte word op 'n bord, in 'n diagonale lyn, met pennetjies vasgespeld. Hoeveel pennetjies word benodig om 25 poskaarte op 'n soortgelyke wyse vas te speld?



(A) 70 (B) 72 (C) 74 (D) 76 (E) 78

1. (A) 20 (B) 120 (C) 150 (D) 280 (E) 300



7. Die sirkeldiagram wys die aantal leerders wat aan 'n sangkompetisie deelneem. As daar 30 Graad 8 leerders in die kompetisie is, hoeveel leerders is daar in totaal wat deelneem aan die kompetisie?

- (A) $\frac{3}{1}$ (B) $\frac{4}{1}$ (C) $\frac{8}{3}$ (D) $\frac{1}{2}$ (E) $\frac{5}{2}$

6. Thabo koop 'n pizza wat in 6 gelyke stukke gesny is. Hy sny elke stuk in 2 kleiner gelyke dele. As Thabo 4 van hierdie kleiner dele eet, watter breukdeel van die hele pizza het hy geëet?

- (A) 58 (B) 64 (C) 85 (D) 88 (E) 90

5. Die syfers 1, 2, 3, 5, 7 en 9 word gebruik om twee 2-syfer getalle te vorm. Elkeen van die syfers kan slegs eenmaal gebruik word. Wat is die grootste moontlike verskil tussen die twee 2-syfer getalle?

- (A) 0 (B) 1 (C) 3 (D) 9 (E) 27

4. As $\sqrt[3]{p} = 1$, wat is die waarde van p ?

- (A) 110 (B) 100 (C) 55 (D) 20 (E) 10

3.
$$\frac{20 \times 22}{2 \times 0 + 2 \times 2} =$$

- (A) 0,25 (B) 0,18 (C) 0,3 (D) 0,5 (E) 0,43

2. Watter een van die volgende getalle lê tussen $\frac{1}{10}$ en $\frac{1}{5}$?

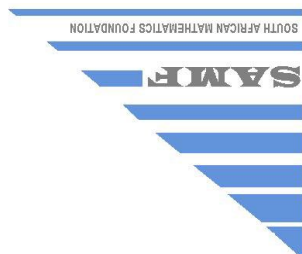
- (A) -75 (B) -10 (C) 5 (D) 20 (E) 80

1. $5^2 - 5 \times 2^2 =$



OLD MUTUAL SUID-AFRIKAANSE WISKUNDE-OLIMPIADE

Georganiseer deur die
SOUTH AFRICAN MATHEMATICS FOUNDATION



2022 EERSTE RONDTE
JUNIOR AFDELING: GRAAD 8

10 Maart 2022
Tyd: 60 minute
Aantal vrae: 20

Instrukties

1. Hierdie is 'n veelvuldige-keuse vraestel. Na elke vraag is vyf antwoorde, genummer A, B, C, D en E. Net een van hulle is reg.
2. Punttoekennings:
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 meetkundige-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 toetsigrouer die teken gee.
8. Antwoorde en oplossings sal beskikbaar wees by www.samf.ac.za

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

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



Die Mathematics Talent Search is 'n gratis aanlyn probleemoplossing
program vir leerders van Gr 7 – 12 aangebied deur die SAMF.
Al wat jy moet doen om deel te neem, is om te klik op
<https://mytutor.chat/samf-talent-search/> of neem 'n foto van die
QR kode om maklik na MyTutor.chat te gaan.