

SOUTH AFRICAN MATHEMATICS OLYMPIAD



Organised by the **SOUTH AFRICAN MATHEMATICS FOUNDATION**

2012 FIRST ROUND SENIOR SECTION: GRADES 10, 11 AND 12

19 March 2012 Time: 60 minutes Number of questions: 20

Instructions

- 1. This is a multiple choice question paper. Each question is followed by 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



PRACTICE EXAMPLES

- 1. As a decimal number 6.28% is equal to
 - (A) 0.0628
- (B) 0.628
- $(C) 6.28 \qquad (D) 62.8$
- (E) 628

- **2.** The value of $1 + \frac{1}{3 + \frac{1}{2}}$ is
 - (A) $\frac{6}{5}$ (B) $\frac{7}{6}$ (C) $\frac{9}{2}$ (D) $\frac{6}{7}$ (E) $\frac{9}{7}$

- **3.** The tens digit of the product $1 \times 2 \times 3 \times \cdots \times 98 \times 99$ is
 - (A) 0
- (B) 1
- (C) 2
- (D) 4
- (E) 9

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- 1. The value of $\frac{1}{4} + 0.025$ is
- (A) 0.05 (B) $\frac{1}{2}$ (C) 0.375
- (D) $\frac{3}{8}$
- 2. In a country with a population of 60 000 000 people, 1% of the population is over 2 metres tall. How many people are over 2 metres tall?
 - (A) 6 000 000
- (B) 600 000
- (C) 60 000
- (D) 6 000
- (E) 600

- 3. The value of $2012^2 2011^2$ is
 - (A) 1
- (B) 2011
- (C) 2012
- (D) 2013
- (E) 4023
- **4.** The mean of five numbers is 12. If one number is removed, the mean of the remaining four numbers is 14. The number that was removed is
 - (A) 2
- (B) 4
- (C) 6
- (D) 8
- (E) 10

5. Two circles of radius 2 touch each other and are inscribed in a large circle as shown. The area of the shaded region is



- (B) 12π
- (C) 24π
- (D) $4 + 4\pi$
- (E) 4π

6. The unit square in fig 1 is surrounded by 8 unit squares to form fig 2. These 9 unit squares are then surrounded again to form fig 3. If this pattern continues, then how many unit squares in total would there be in figure 10?





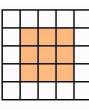


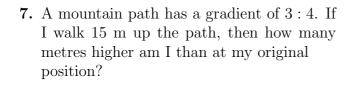
Fig 1

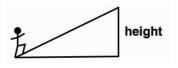
Fig 3

- (A) 169
- (B) 225
- (C) 289
- (D) 361

Fig 2

(E) 441





(A) 4

(B) 6

(C) 9

(D) 10

(E) 15

8. If your watch loses 5 minutes each hour and you set the time correctly at 07:00, what is the actual time when your watch shows later that morning that it is 09:45?

(A) 09:55

(B) 10:00

(C) 10:05

(D) 10:10

(E) 10:15

9. A pack of 52 cards is dealt out to 10 people seated around a circular table in such a way that the first person gets the 1st card, the fourth person gets the 2nd card, the seventh person gets the 3rd card, the tenth person gets the 4th card, the third person gets the 5th card and so on. Which person gets the last card?

(A) 2nd

(B) 4th

(C) 5th

(D) 6th

(E) 7th

10. A straight line passes through the points (2,3) and (4,7). Which one of the following points is also on the line?

(A) (0,2)

(B) (1,2)

(C) (2,4)

(D) (3,5)

(E) (4,5)

11. The value of $1+2+3-4+5+6+7-8+\ldots+97+98+99-100$ is

(A) 4010

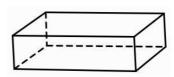
(B) 5050

(C) 3050

(D) 2450

(E) 1206

12. How many pairs of parallel edges are there in the rectangular box shown?



(A) 18

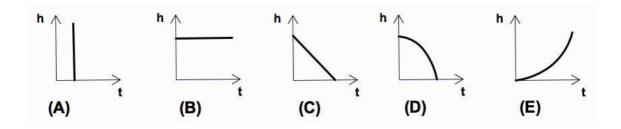
(B) 12

(C) 24

(D) 8

(E) 16

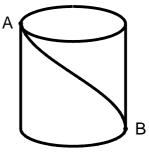
13. A ball is dropped from the roof of a tall building. Which one of the following graphs best represents the height h of the ball above the ground with respect to time t?



- 14. In a set of numbers there are 5 even numbers and 4 odd numbers. If 2 numbers are chosen at random from the set, without replacement, then the probability that the sum of these two numbers is even is
 - (A) $\frac{4}{9}$ (B) $\frac{1}{3}$ (C) $\frac{2}{9}$ (D) $\frac{2}{3}$

- 15. The current Olympic record for the 100 m sprint is 9.69 s and held by Usain Bolt from Jamaica. How fast is this approximately in km/h?
 - (A) 21
- (B) 25
- (C) 30
- (D) 37
- (E) 43

16. The cylinder alongside has a radius of 4 cm and a height of 8 cm. André, the ant, walks along the shortest path on the curved surface of the cylinder from point A at the top to point B, which is at the bottom and on the opposite side of the cylinder. The distance in cm that André travels, is



- (A) $4(\pi + 2)$ (B) $4\sqrt{\pi^2 + 4}$ (C) $8\sqrt{2}$
- (D) 16
- (E) $4\pi + 8$

17. In a group of learners a total of 54 take history, 48 take geography and 12 do not take history or geography. If 16 learners take both history and geography, then the total number of learners in the group is

(A) 82

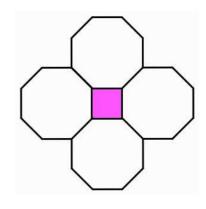
(B) 130

(C) 114

(D) 106

(E) 98

18. A square is surrounded by four regular octagons as shown. If an equilateral triangle is surrounded in the same way by three regular polygons, how many sides will each of these polygons have?



(A) 6

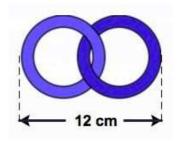
(B) 8

(C) 12

(D) 15

(E) 18

19. A chain with two links is 12 cm long. A chain with five links is 27 cm long. What is the length, in cm, of a chain with forty links?



(A) 202

(B) 267

(C) 360

(D) 480

(E) 640

20. If P is a point inside quadrilateral ABCD with PA = 2, PB = 3, PC = 5 and PD = 6, then the maximum possible area of ABCD is

(A) 31.5

(B) 35.5

(C) 37.5

(D) 26.5

(E) 23.5