

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2011 SECOND ROUND JUNIOR SECTION

17 May 2011

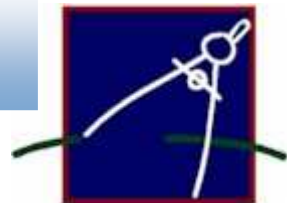
Time: 120 minutes

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 4 marks in part A, 5 marks in part B and 6 marks in part C.
 - 2.2. For each incorrect answer one mark will be deducted. There is no penalty for unanswered questions.
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.***



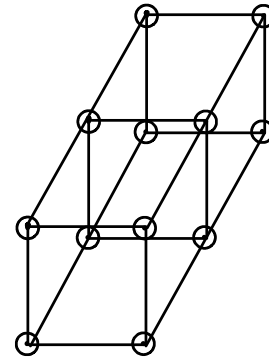
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Organisations involved: AMESA, SA Mathematical Society,
SA Akademie vir Wetenskap en Kuns

Part A: (Each correct answer is worth 4 marks)

1. Which fraction is closest to 2?
(A) $\frac{29}{19}$ (B) $\frac{39}{29}$ (C) $\frac{49}{39}$ (D) $\frac{59}{49}$ (E) $\frac{69}{59}$
2. When Johan added the factors of 40 he left one out by mistake and thus arrived at a total of 70. The factor he left out was
(A) 4 (B) 5 (C) 8 (D) 10 (E) 20

3. The diagram shows part of some scaffolding which consists of many equal rods joined together by connectors. The diagram shows a structure of length 2 units. The number of rods required to make a structure of length 40 units is

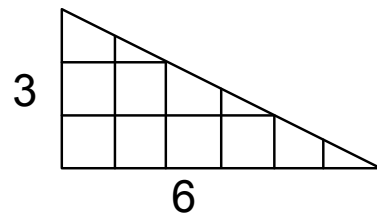


- (A) 324 (B) 344 (C) 364 (D) 384 (E) 404
4. When 20^{11} is calculated, the number of digits in the result is
(A) 11 (B) 12 (C) 13 (D) 14 (E) 15
5. Rebecca has some money. She gives 10% of it to her sister, and then 20% of what is left to her brother. The percentage of the money that she kept for herself is
(A) 80 (B) 72 (C) 66 (D) 50 (E) 30

Part B: (Each correct answer is worth 5 marks)

6. The formula for converting $^{\circ}\text{F}$ into $^{\circ}\text{C}$ is $C = \frac{5}{9}(F - 32)$. The temperature in $^{\circ}\text{C}$ which is twice as big when converted to $^{\circ}\text{F}$ is
(A) 80° (B) 100° (C) 120° (D) 140° (E) 160°
7. Boris is 4 km West of a fixed point O, travelling towards O at a steady speed of 10 km per hour. Otto is 8 km East of O, travelling away from O at a steady speed of 6 km per hour. When Boris reaches O, the distance of Otto from O will be
(A) 5,6 km (B) 9,6 km (C) 9,8 km (D) 10,4 km (E) 23 km

8. The diagram shows a triangular area that has been covered using identical square tiles of size 1 unit. If the triangle has sides of length 3 units and 6 units, and if each square tile can be cut at most once, then the minimum number of tiles needed to cover this triangle is

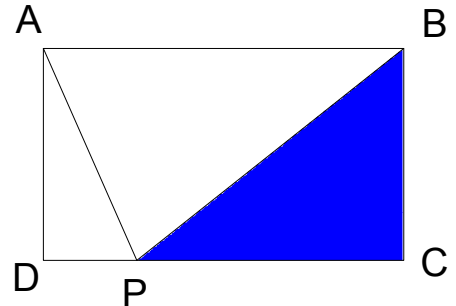


- (A) 7 (B) 8 (C) 9 (D) 10 (E) 11

9. The value of $1\frac{1}{2} \times 1\frac{1}{3} \times 1\frac{1}{4} \times \dots \times 1\frac{1}{19}$ is

- (A) 5 (B) 10 (C) 15 (D) 20 (E) 25

10. The area of $\triangle ADP$ is $\frac{1}{5}$ of the area of the rectangle. The proportion of the rectangle that is shaded is



- (A) $\frac{3}{10}$ (B) $\frac{2}{5}$ (C) $\frac{4}{15}$ (D) $\frac{1}{3}$ (E) $\frac{2}{7}$

11. Four different natural numbers all leave a remainder of 6 when divided by 7. If no two of them have a common factor, what is the least possible value of their sum?

- (A) 87 (B) 101 (C) 115 (D) 125 (E) 145

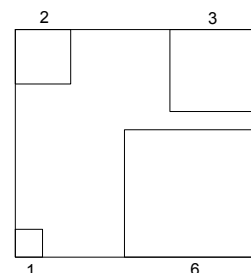
12. A leap year has 366 consecutive days. What is the probability that a leap year has 53 Sundays in it?

- (A) $\frac{53}{366}$ (B) $\frac{1}{366}$ (C) $\frac{2}{7}$ (D) $\frac{2}{53}$ (E) $\frac{4}{7}$

13. Avril has cards: whenever an even number is on one side of the card, there must be an odd number on the other side. Six of her cards lie on a table, and four of those show an odd number. What is the maximum number of odd numbers we might see if we were able to look at both sides of each of those six cards?

- (A) 4 (B) 5 (C) 8 (D) 10 (E) 12

14. A square piece of paper has squares cut off its corners. The sides of the removed squares have lengths 1 cm, 2 cm, 3 cm and 6 cm. Because of this the area of the piece of paper has been halved. The perimeter of the remaining piece of paper is

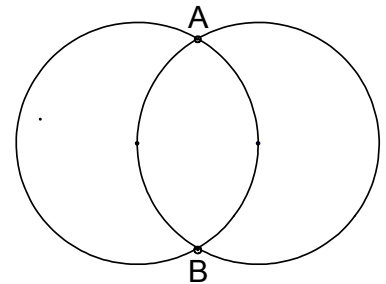


- (A) 36 cm (B) 40 cm (C) 44 cm (D) 48 cm (E) 52 cm

15. Among the pupils at a school, the ratio of boys to girls is 2 : 3. If 5 more boys joined the school that ratio would become 7 : 10. The number of girls in the school is
- (A) 50 (B) 75 (C) 100 (D) 125 (E) 150

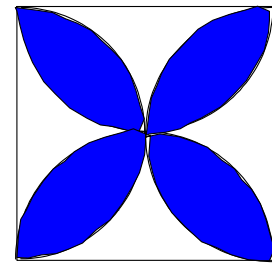
Part C: (Each correct answer is worth 6 marks)

16. When two circles of radius 2 cm each pass through the centre of the other, the distance in cm between the points of intersection A and B is



- (A) $\sqrt{5}$ (B) $\sqrt{3} + 2$ (C) $\sqrt{3} + 1$ (D) $2\sqrt{3}$ (E) $2\sqrt{5}$

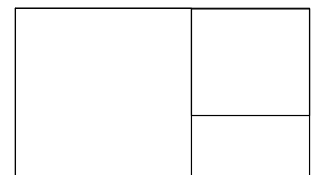
17. The figure shows a square with semicircles drawn on its sides. The length of a side of the square is 2 units. The area of the four-leaf shaded region is



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

18. A three-digit number is written down; then the same digits are reversed to give a new three-digit number. The smaller of these numbers is subtracted from the larger. Which of the following might be the result?
- (A) 729 (B) 189 (C) 198 (D) 459 (E) 759

19. A rectangular sheet of paper has a square removed from one end. The remaining rectangle has a square removed from one end. The rectangle now remaining has perimeter $\frac{3}{8}$ that of the original rectangle. The ratio of the shorter side of the original rectangle to its longer side is



- (A) 3 : 5 (B) 1 : 3 (C) 3 : 8 (D) 1 : 2 (E) 5 : 8

20. Three-digit numbers are formed that use only different odd digits (so not 551, for instance). The sum of all the possible numbers is
- (A) 22 200 (B) 33 300 (C) 44 400 (D) 55 500 (E) 66 600