SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the

SOUTH AFRICAN MATHEMATICS FOUNDATION

2015 FIRST ROUND

JUNIOR SECTION: GRADE 8

12 March 2015 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. *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

1. The value of $2 - (0 - (1 - 5))$ is

(A) 3 (B) 1 (C) 0 (D) –1 (E) –2

2. Human hair grows at a rate of about 1 centimetre per month. This is equivalent to about how many millimetres every ten years?

(A) 12 (B) 120 (C) 1 200 (D) 12 000 (E) 120 000

3. If $\frac{12}{x}$ is a natural number and x is a natural number, how many possible values are there for x?

(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

4. If $\frac{20}{3} = \frac{120}{y}$ then y equals

(A) 9 (B) 12 (C) 15 (D) 18 (E) 20

5. The last digit of $2011 \times 2013 \times 2015 - 2010 \times 2012 \times 2014$ is

(A) 0 (B) 1 (C) 2 (D) 4 (E) 5

6. If today is Thursday, what day of the week will it be in 150 days from now?

(A) Sunday (B) Monday (C) Tuesday (D) Wednesday (E) Thursday

7. It is said that you can only fold a piece of paper in half 7 times. Harold folds a sheet of paper in half 5 times and then makes a hole in the folded paper. How many holes does the sheet of paper have after it is unfolded again?

(A) 32 (B) 36 (C) 81 (D) 50 (E) 64

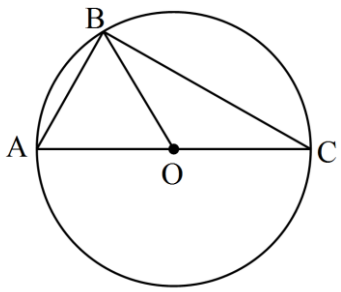
8. Alfred and four other people want to be in a group photograph. In how many different ways can they be arranged in a row with Alfred in the middle?

(A) 4 (B) 8 (C) 12 (D) 24 (E) 40

9. If $a \bullet b$ means the value of $ab + a + b$, and $5 \bullet x = 35$, the value of x must be

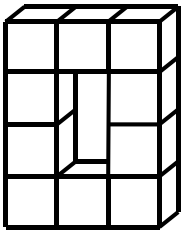
(A) 5 (B) 7 (C) 9 (D) 12 (E) 15

10. In the figure, triangle ABC is inscribed in the circle with centre O and diameter AC. If AB = AO, the size of angle $B\hat{C}O$ is



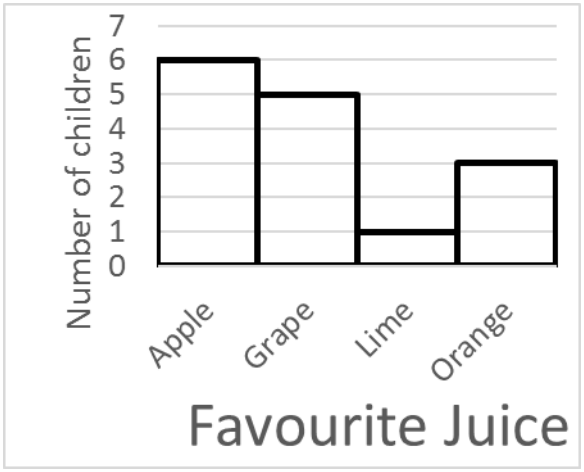
(A) 22° (B) 27° (C) 30° (D) 45° (E) 60°

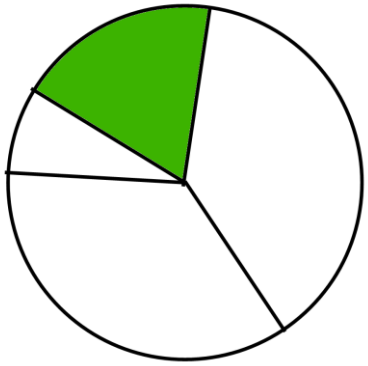
11. Ten cubes are glued together as shown in the diagram and then the entire figure is painted.
How many of the cubes are painted on exactly four faces?



(A) 10 (B) 8 (C) 6 (D) 5 (E) 4

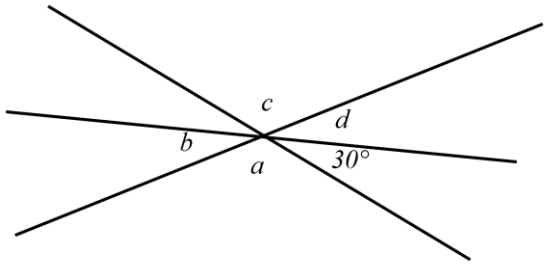
12. Children were asked about their favourite juice. The results of the survey are shown in the bar graph and also in the pie chart, drawn to scale. The size of the angle in the shaded sector is





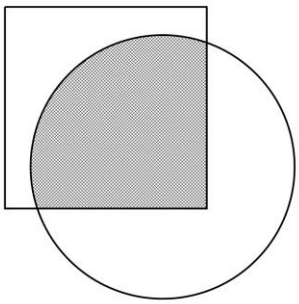
(A) 45° (B) 60° (C) 72° (D) 75° (E) 90°

13. The diagram shows three intersecting straight line segments. The average of a, b, c and d is



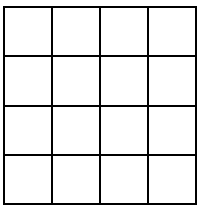
(A) 45° (B) 55° (C) 65° (D) 75° (E) 85°

14. The shaded area in the diagram is formed when a square and a circle overlap. The shaded area is $\frac{5}{8}$ of the area of the circle and $\frac{1}{2}$ the area of the square. If the area of the circle is 80 cm^2, the length of a side of the square, in cm, is



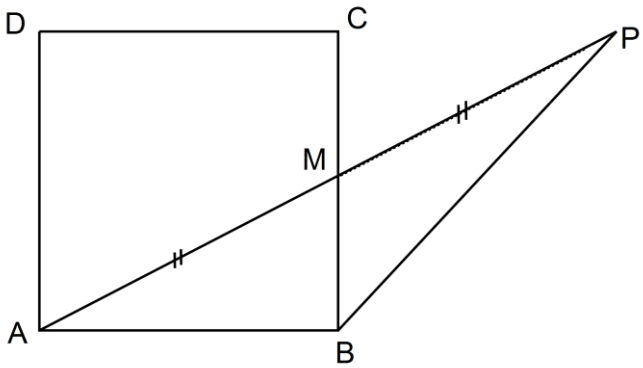
(A) $\sqrt{70}$ (B) $\sqrt{80}$ (C) $\sqrt{90}$ (D) 10 (E) $\sqrt{120}$

15. A tick and a cross are to be placed in the grid of 16 blocks alongside, no more than one in a block. No column of four blocks may contain both symbols and no row of four blocks may contain both symbols. In how many ways can this be done?



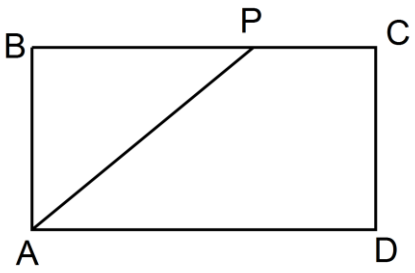
(A) 24 (B) 36 (C) 42 (D) 108 (E) 144

16. ABCD is a square. M is the midpoint of BC, and of AP. The size of $C\hat{B}P$ is



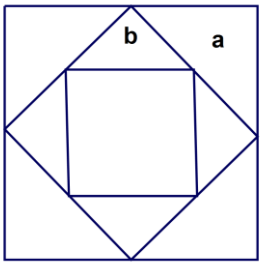
(A) 22,5° (B) 30° (C) 36° (D) 45° (E) 50°

17. ABCD is a rectangle and P is a point on BC. If the area of triangle ABP is one third of the area of the rectangle, then the ratio BP : PC is



(A) 5 : 2 (B) 3 : 2 (C) 2 : 1 (D) 3 : 1 (E) 9 : 4

18. The midpoints of the sides of a square are joined to form a new square. Inside that one a third square is formed by joining the midpoints of the second square. The ratio of the area of the triangle marked **a** to the area of the triangle marked **b** is



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

19. How many of the integers between 97 and 199 are multiples of 2 or 3?

(A) 33 (B) 40 (C) 55 (D) 60 (E) 68

20. If t toffees cost c cents, the number of toffees that can be bought for r rands is

(A) $\frac{100rc}{t}$ (B) $\frac{100rt}{c}$ (C) $\frac{100r}{ct}$ (D) $\frac{rt}{100c}$ (E) $\frac{100c}{rt}$