SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the

SOUTH AFRICAN MATHEMATICS FOUNDATION

2015 FIRST ROUND

JUNIOR SECTION: GRADE 9

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.

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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. One of the factors of 48 is chosen at random. What is the probability that the chosen factor is NOT a multiple of 4?

(A) 40%   (B) 30%   (C) 25%   (D) 20%   (E) 10%

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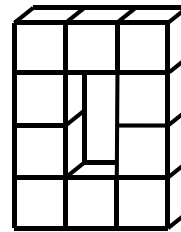
(A) 10   (B) 8   (C) 6   (D) 5   (E) 4

5. 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
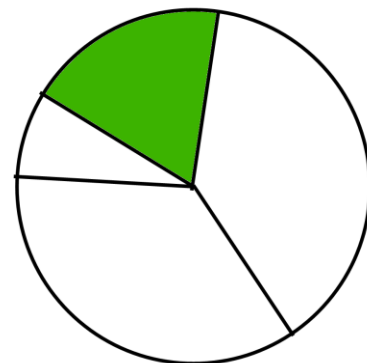
(A) 45°   (B) 60°   (C) 72°   (D) 75°   (E) 90°

6. 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

7. Mollie, 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 Mollie and Alfred together in the middle?

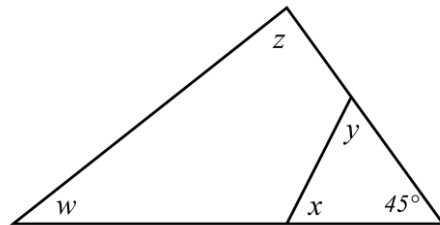   (A) 8   (B) 16   (C) 24   (D) 48   (E) 80

8. The digits from 1 to 9 are added, in order, over and over again until the total is 460.
   $$1+2+3+4+5+6+7+8+9+1+2+3+\ldots$$
   The last digit that was added is

   (A) 2   (B) 4   (C) 6   (D) 8   (E) 9

9. In the diagram, $w+x+y+z$ equals

   (A) 240°   (B) 255°   (C) 270°   (D) 295°   (E) 300°

10. A hiker walks 1 km East, then 2 km North, then 3 km West, then 4 km South, then 5 km East and finally 6 km North. The hiker's straight-line distance in km from the starting point is

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

11. When a is increased by 20% and b is decreased by 20% the resulting values are equal. The ratio of a to b is

   (A) $\dfrac{1}{2}$ (B) 1   (C) $\dfrac{2}{3}$ (D) $\dfrac{3}{4}$ (E) $\dfrac{4}{3}$

12. 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?
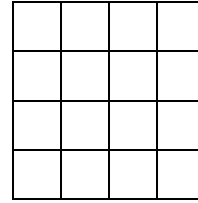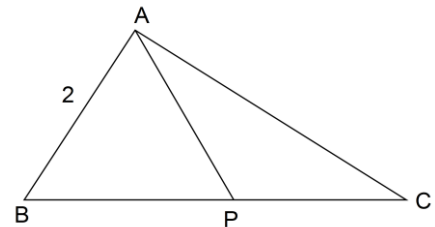

(A) 144   (B) 108   (C) 42   (D) 36   (E) 24

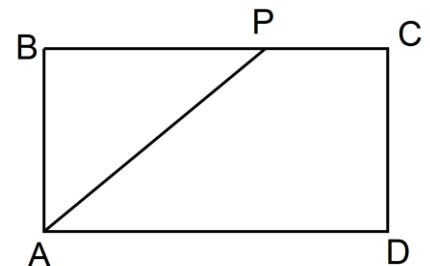**13.** If $a + 2b = 13$ and $5a - 2b = 5$, the value of b is

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

14. $\triangle$ ABC is right-angled at A, and $\triangle$ ABP is equilateral with $AB = 2$. The length of AC is

(A) $\sqrt{6}$ (B) $\sqrt{8}$ (C) $\sqrt{10}$ (D) $\sqrt{12}$ (E) 4

15. 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
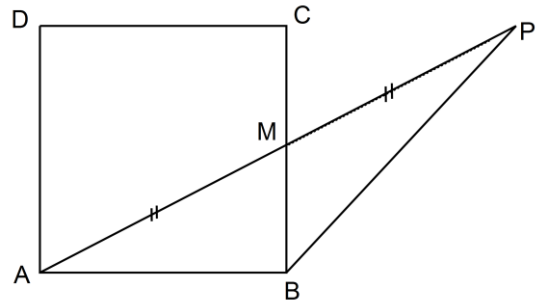

(A) 5 : 2   (B) 3 : 2   (C) 2 : 1   (D) 3 : 1   (E) 9 : 4

16. The number of different positive integers such that $\dfrac{n}{n+4} < \dfrac{4}{9}$ is

(A) 0   (B) 1   (C) 2   (D) 3   (E) 4

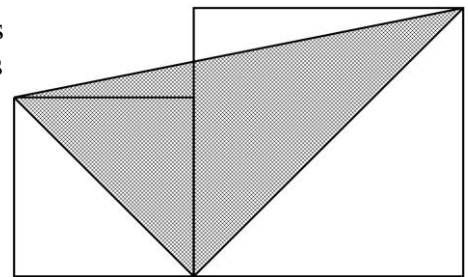**17.** ABCD is a square. M is the midpoint of BC, and of AP. The size of $C\hat{B}P$ is

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

18. How many of the integers between 97 and 199 are multiples of 2 or 3?
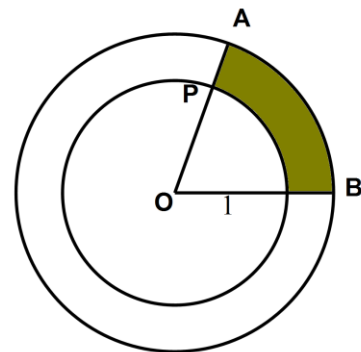
   (A) 33   (B) 40   (C) 55   (D) 60   (E) 68

19. Two squares are adjacent to each other as shown. One has sides of length of 5 cm and the other has sides of length 7 cm. The area in cm^2 of the shaded region is

   (A) 35   (B) 35,5   (C) 36   (D) 36,5   (E) 37

20. Two circles have the same centre O, and the radius of the smaller one is 1. The radii OA and OB are such that the area of the shaded region is equal to one quarter of the area of the sector OAB.
The length of PA is

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