SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2014 FIRST ROUND
JUNIOR SECTION: GRADE 9

13 March 2014 **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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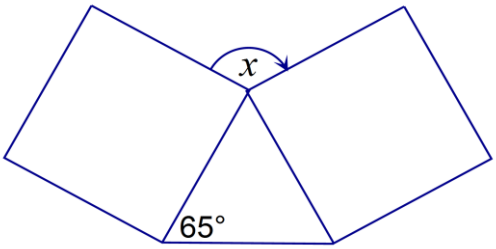
Organisations involved: AMESA, SA Mathematical Society,
SA Akademie vir Wetenskap en Kuns

Grade 9 First Round 2014

1. Two identical squares meet at a vertex as shown. The size of the angle marked x is



(A) 105° (B) 120° (C) 130° (D) 150° (E) 160°

2. The product of three prime numbers is 42. The sum of these three numbers is

(A) 12 (B) 13 (C) 14 (D) 15 (E) 16

3. Which integer is nearest in value to $\sqrt{\frac{60.01}{0.98} + 3.96}$?

(A) 0 (B) 3 (C) 6 (D) 8 (E) 9

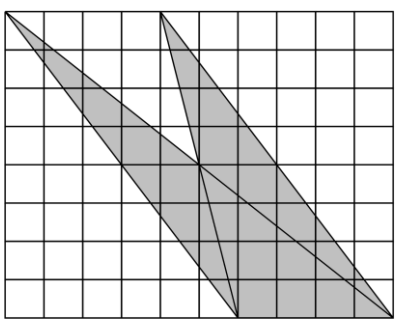
4. Let $\begin{bmatrix} a \\ b \\ c \end{bmatrix}$ be defined as $a^b - c$. The value of $\begin{bmatrix} 5 \\ 2 \\ 6 \end{bmatrix}$ is

(A) 17 (B) 18 (C) 19 (D) 20 (E) 21

5. The value of $\sqrt{(9)^{\sqrt{4}} \times \left(\sqrt{9}\right)^4}$ is

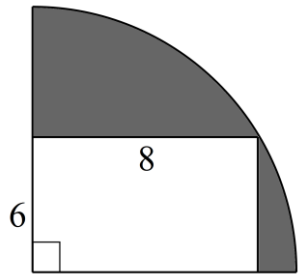
(A) 4 (B) 9 (C) 27 (D) 36 (E) 81

6. A 10×8 grid is made up of squares each with side 1 cm. The area of the shaded region is



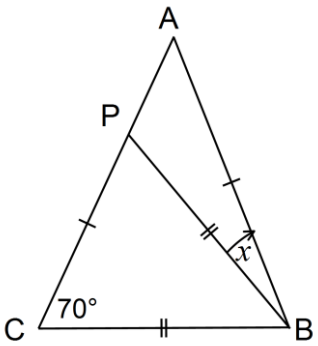
(A) 10 cm^2 (B) 16 cm^2 (C) 20 cm^2 (D) 24 cm^2 (E) 28 cm^2

7. A rectangle has one corner placed at the centre of a quarter-circle and the opposite corner on the circumference of the circle. If the rectangle has width 6 cm and length 8 cm, then the shaded area in cm^2 is



(A) $9\pi - 48$ (B) $16\pi - 48$ (C) $25\pi - 48$ (D) $36\pi - 48$ (E) $49\pi - 48$

8. In Δ ABC, AC = AB. P is a point on AC so that BP = BC. If $\hat{C} = 70°$, then the size of the angle marked x is

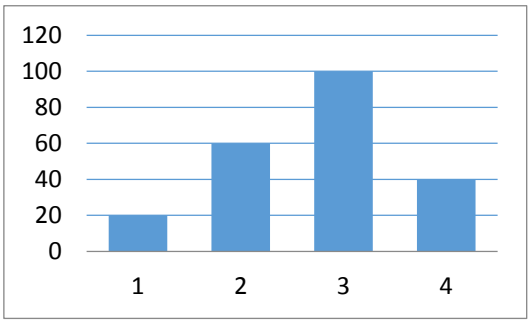


(A) 30° (B) 36° (C) 40° (D) 45° (E) 46°

9. If $x = w + 5$, $w = y - 3$ and $y = 2$, then the value of x is

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

10. Boris has been training for four weeks. Each week he records the total distance he ran that week in a bar graph. How far must he run in the fifth week for his average distance per week to be 60 km?

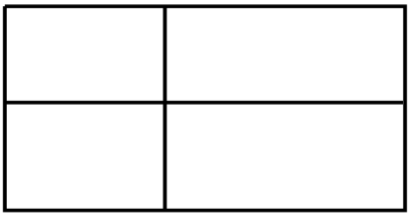


(A) 20 km (B) 40 km (C) 60 km (D) 80 km (E) 100 km

11. Three normal dice are rolled. The probability that they all show the same number is

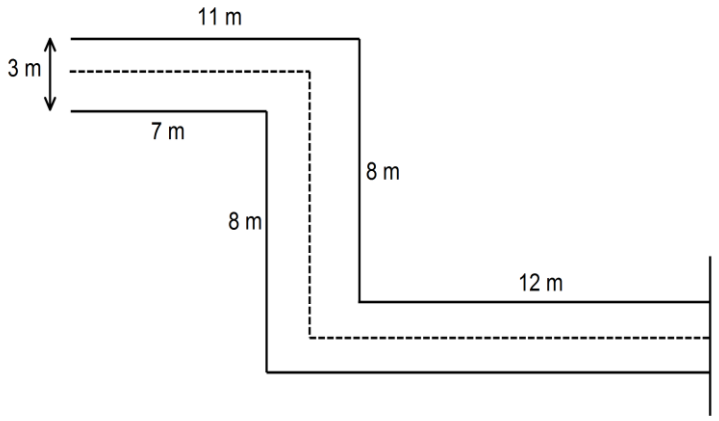
(A) $\frac{1}{6}$ (B) $\frac{1}{12}$ (C) $\frac{1}{18}$ (D) $\frac{1}{36}$ (E) $\frac{1}{72}$

12. A rectangle is divided into four rectangles by two perpendicular lines. The perimeters of these smaller rectangles are 4, 5, 6 and 7. The perimeter of the original rectangle is



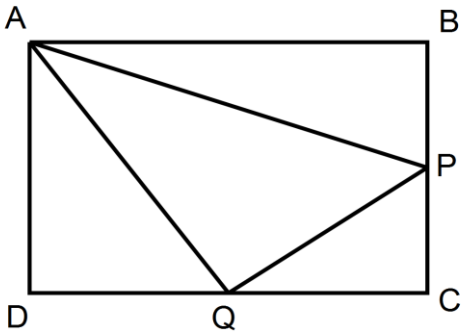
(A) 11 (B) 14 (C) 17 (D) 20 (E) 22

13. A school corridor has three sections at right angles. Some dimensions are given. The length of the dashed line down the centre of the corridor is



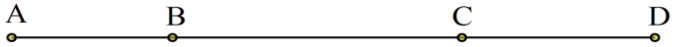
(A) 27 m (B) 29 m (C) 31 m (D) 33 m (E) 35 m

14. P is the midpoint of side BC of a rectangle, and Q is the midpoint of side DC. The area of rectangle ABCD is 72 cm^2. The area of triangle APQ is



(A) 21 cm^2 (B) 27 cm^2 (C) 30 cm^2 (D) 36 cm^2 (E) 40 cm^2

15. Four points are on a line segment as shown below. If AB : BC = 1 : 3 and BC : CD = 9 : 5 then AB : BD is



(A) 3 : 14 (B) 1 : 4 (C) 2 : 9 (D) 1 : 5 (E) 1 : 6

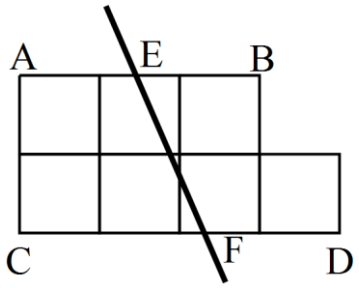
16. The value of $20^2 - (65^2 - 63^2)$ is

(A) 120 (B) 144 (C) 169 (D) 180 (E) 200

17. The last digit of $5^n - 2^n$ is 7, so n could be

(A) 100 (B) 101 (C) 102 (D) 103 (E) 104

18. The shape alongside, made up of seven equal squares, is divided into two parts of equal area by the line shown. The line cuts the shape at points E and F.



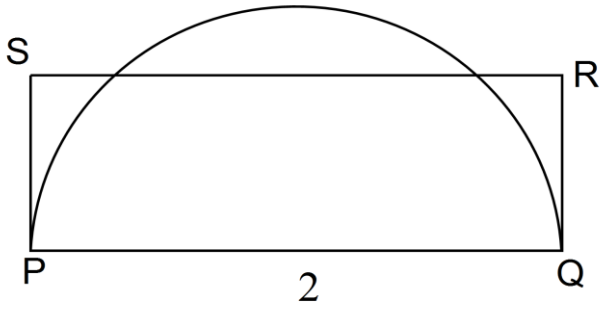
If the sum of the lengths AE and CF is 56 cm, the area of each individual square is

(A) 144 cm^2 (B) 169 cm^2 (C) 189 cm^2 (D) 225 cm^2 (E) 256 cm^2

19. A two-digit number is chosen and its digits are added together. When this original number is increased by 5, the new sum of digits is double what it was originally. The number of two-digit numbers for which this is possible is

(A) 6 (B) 5 (C) 4 (D) 3 (E) 2

20. The diagram shows a rectangle PQRS with a semicircle on PQ as diameter. The length of PQ is 2 units.



The area that is inside the rectangle but outside the semicircle is equal to the area that is inside the semicircle but outside the rectangle.

The length of PS is

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