SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2013 FIRST ROUND
JUNIOR SECTION: GRADE 9

14 March 2013 **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. $10{,}1 + 1{,}01 =$

(A) 11,01 (B) 10,11 (C) 11,11 (D) 1,1001 (E) 10,01

2. If 1st January 1985 was a Tuesday, how many Tuesdays were there in 1985?

(A) 50 (B) 51 (C) 52 (D) 53 (E) 54

3. The three digit number 7*d*2 is divisible by 3 and by 11. The digit *d* must be

(A) 1 (B) 2 (C) 6 (D) 7 (E) 9

4. The decimal form of $3 \div 7$ is the recurring decimal 0,428571428571..... The digit in the 2013th decimal place is

(A) 4 (B) 2 (C) 8 (D) 5 (E) 7

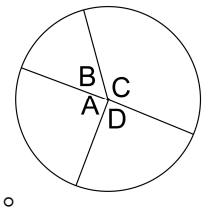
5. $(2 + 4 + 6 + ... + 50) - (1 + 3 + 5 + ... + 49) =$

(A) 23 (B) 25 (C) 40 (D) 99 (E) 100

6. A bathroom floor is covered by square tiles: the floor is 5 tiles wide and 8 tiles long. If one of the floor tiles is chosen at random, what is the probability that it is at the edge of the floor?

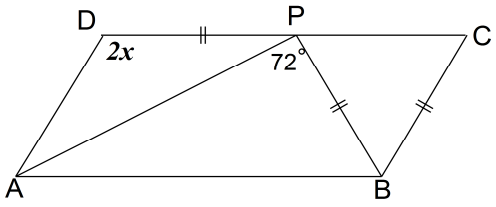
(A) $\frac{19}{40}$ (B) $\frac{1}{2}$ (C) $\frac{21}{40}$ (D) $\frac{11}{20}$ (E) $\frac{23}{40}$

7. A circle is divided into four regions by radii. Angle A is $\frac{2}{3}$ the angle C while angle D is twice angle B. Angles B and C are supplementary. Angle C is



(A) 100° (B) 110° (C) 120° (D) 135° (E) 145°

8. ABCD is a parallelogram. BP = DP = BC. The size of *x* is

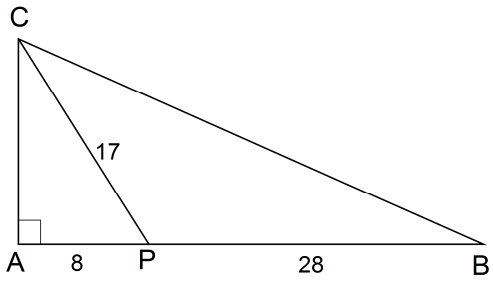


(A) 52° (B) 54° (C) 56° (D) 58° (E) 60°

9. How many zeros are there in the result of $5675^2 - 4325^2$?

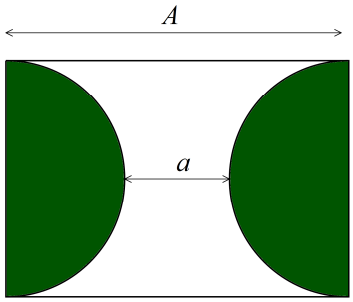
(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

10. P is a point on side AB of the right-angled triangle ABC. The distances of P from the vertices of the triangle are as shown. The length of BC is



(A) 42 (B) 41 (C) 40 (D) 39 (E) 38

11. Two semicircles are placed in a rectangle of length A. The shortest distance between the semicircles is a. The total area of the semicircles (shaded) is



(A) $\pi\left(\frac{A+a}{2}\right)^2$ (B) $\pi\left(A-\frac{a}{2}\right)^2$ (C) $\pi(A-a)^2$ (D) $\pi\left(\frac{A}{2}-a\right)^2$ (E) $\pi\left(\frac{A-a}{2}\right)^2$

12. As n gets larger and larger the value of $\frac{n+2}{2n+1}$ gets closer and closer to

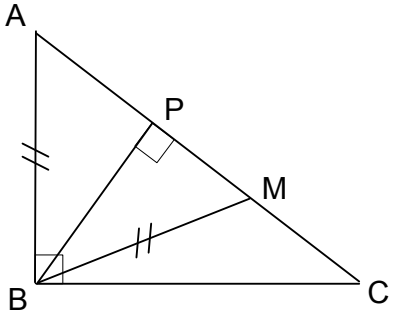
(A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) 1 (E) 2

13. The sequence 123456789123456789123... is continued until the sum of all the digits used is 460. The last digit in the sequence is

(A) 3 (B) 4 (C) 5 (D) 6 (E) 7

14. P and M are points on side AC of the right-angled triangle ABC. AB = BM, and BP is perpendicular to AC. Which statement is not necessarily true?

1. $A\hat{B}P = P\hat{B}M$
2. $\hat{A} = B\hat{M}A$
3. $A\hat{B}P = M\hat{B}C$
4. $\hat{C} = P\hat{B}M$
5. $A\hat{P}B = B\hat{P}M$

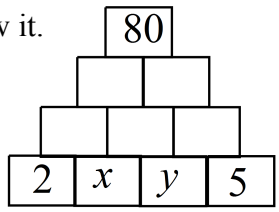


(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

15. I have five books, one of each colour red, yellow, green, blue, white. In how many ways can I place them in a row?

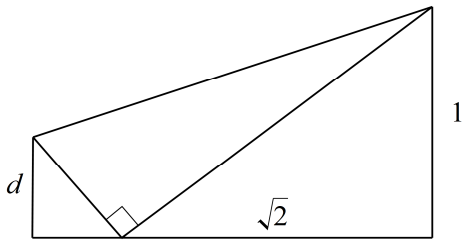
(A) 5 (B) 10 (C) 30 (D) 60 (E) 120

16. The number in each box is the product of the numbers in the two boxes below it. In this case the value of xy is



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

17. A rectangular sheet of paper with sides $\sqrt{2}$ and 1 has been folded as shown, so that one corner meets the opposite long edge. The length d is

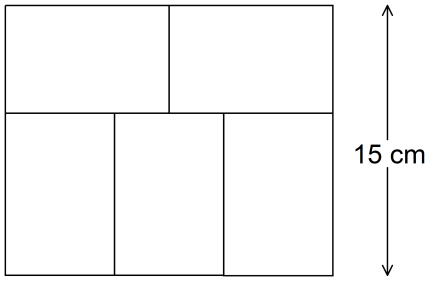


(A) $\sqrt{2}-1$ (B) $\sqrt{2}+1$ (C) $2\sqrt{2}-2$ (D) $\sqrt{3}-1$ (E) $\sqrt{5}-2$

18. A set of 12 numbers has an average of 18, but the smallest and largest have an average of 28. What is the average of the others?

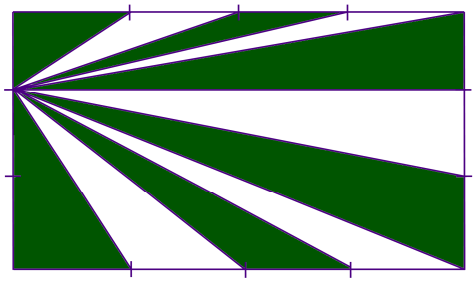
(A) 14 (B) 15 (C) 16 (D) 17 (E) 18

19. Five identical rectangles are placed to form a new rectangle. The width of the new rectangle is 15 cm. The area of the big rectangle (in cm^2) is



(A) 270 (B) 300 (C) 330 (D) 360 (E) 450

20. The long sides of a rectangle are divided into four equal parts and the short sides are divided into three equal parts. One point on a short side is joined to all the others. The fraction of the original rectangle that is shaded is



(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{7}{12}$ (D) $\frac{6}{11}$ (E) $\frac{13}{24}$