THE SOUTH AFRICAN MATHEMATICS OLYMPIAD

organised by the SOUTH AFRICAN ACADEMY OF SCIENCE AND ARTS
in collaboration with OLD MUTUAL, AMESA and SAMS

SPONSORED BY OLD MUTUAL

SECOND ROUND 1999
JUNIOR SECTION: GRADES 8 AND 9
22 JUNE 1999
TIME: 120 MINUTES
NUMBER OF QUESTIONS: 20

Instructions:

1. Do not open this booklet until told to do so by the invigilator.
2. 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.
3. Scoring rules:
   Each correct answer is worth: 3 marks in Part A,
   5 marks in Part B and
   7 marks in Part C.
   There is no penalty for an incorrect answer or an unanswered question.
4. You must use an HB pencil.
   Rough paper, ruler and rubber are permitted.
   Calculators and geometry instruments are not permitted.
5. Diagrams are not necessarily drawn to scale.
6. Indicate your answers on the sheet provided.
7. When the invigilator gives the signal, start the problems.
   You will have 120 minutes working time for the question paper.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

KEER DIE BOEKIE OM VIR AFRIKAANS

P.O. BOX 538, PRETORIA, 0001 TEL: (012) 328-5082 FAX (012) 328-5091
E-mail: akademie@mweb.co.za

PRACTICE EXAMPLES

1. $14 + 8 - 2 =$

(A) 8 (B) 14 (C) 18 (D) 20 (E) 22

2. If $2x - 8 = 0$, then x is equal to

(A) 1 (B) 2 (C) 4 (D) 6 (E) 8

3. Arrange the numbers 0,523; 0,458; 1,003; 0,791 from smallest to largest.

(A) 0,458; 0,523; 0,791; 1,003
(B) 0,523; 0,791; 1,003; 0,458
(C) 0,458; 0,791; 0,523; 1,003
(D) 1,003; 0,791; 0,523; 0,458
(E) 0,523; 0,458; 1,003; 0,791

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PART A: (Each correct answer is worth 3 marks)

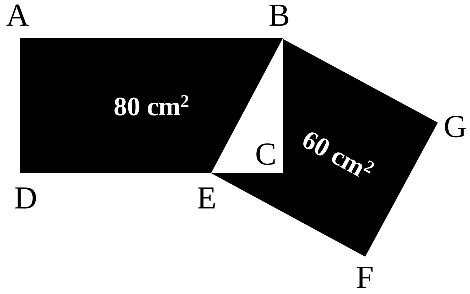
1. If $(1\,053 \times 15) - 450 = ❤ \times 15$, then ❤ =

(A) 603 (B) 105 (C) 1 050 (D) 1 023 (E) 60,3

2. Freedom Day, 27 April 1999, was celebrated on a Tuesday. On what day of the week will we celebrate Freedom Day in the year 2010?

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

3. The figures ABCD and BGFE are overlapping rectangles as shown. The area of rectangle ABCD is 80 cm^2 and the area of rectangle BGFE is 60 cm^2.
The difference in area, in cm^2, between the black areas ABED and BCEFG is



(A) 40 (B) 24 (C) 20
(D) 12 (E) impossible to determine.

4. To pin up a rectangular picture Sam needs 4 pins, one at each corner. For two pictures he needs only 6 pins since he can overlap pictures. What is the smallest number of pins he needs to pin up 10 pictures?

(A) 24 (B) 22 (C) 20 (D) 18 (E) 16

5. In isosceles ΔABC, AB = 2BC. If the perimeter of ΔABC is 200 mm, then the length of AC in millimetres is

(A) 120 (B) 40 (C) 50 (D) 10 (E) 80

6. 1 000 dots are evenly spaced on the circumference of a circle. They are numbered from 1 to 1 000 with dot 1 000 opposite dot 500. Which dot is opposite dot 657?

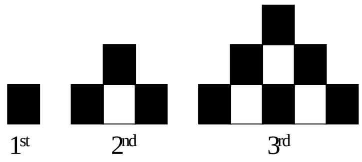
(A) 156 (B) 157 (C) 158 (D) 159 (E) 160

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

7. Three parties contested an election with 100 000 voters who all cast valid votes. One of the parties won the election, obtaining more votes than either of the other two parties. What is the smallest number of votes this party could have obtained?

(A) 33 333 (B) 33 334 (C) 50 000 (D) 50 001 (E) 66 667

8. Three figures consist of alternate black and white square tiles as shown. If this pattern continues, what percentage of the number of tiles in the 50th figure will be black?



(A) 49 (B) 50 (C) 51 (D) $66\frac{2}{3}$ (E) 75

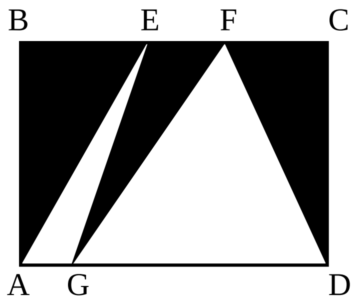
9. If the length to breadth ratio is the same whether a book is opened or closed, find the ratio of length to breadth.

(A) $\sqrt{2}:1$ (B) $\sqrt{2}:2$ (C) $2:1$ (D) $4:1$ (E) $8:1$

10. The LCM of 42 and ***n*** is 462. Then ***n*** cannot be

(A) 33 (B) 66 (C) 88 (D) 231 (E) 462

11. In rectangle ABCD, AD = 12 cm, AB = 7 cm and EF = 5 cm. The black area, in cm^2, is



(A) 42 (B) 35 (C) 49 (D) 56

(E) Impossible to find with the given information.

12. In the following calculation, ***a*** and ***b*** represent missing digits.
If $79\,287 \div \boldsymbol{a}21 = 2\boldsymbol{b}7$, then $\boldsymbol{a}+\boldsymbol{b}=$

(A) 3 (B) 4 (C) 7 (D) 8 (E) 13

13. Each male honey-bee has a single female parent whilst each female honey-bee has both a male and a female parent. In the 10th generation back, only, how many ancestors does a male honey-bee have?

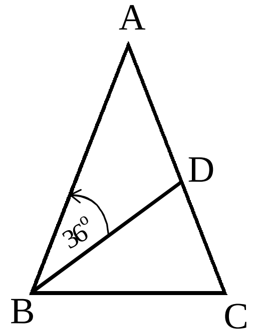
(A) 89 (B) 144 (C) 10 (D) 512 (E) 233

14. In ΔABC $AB = AC$ and $BD = BC$.

If $A\hat{B}D = 36^\circ$, the size of $A\hat{B}C$ in degrees is

(A) 45 (B) 72 (C) 75

(D) 54 (E) 60

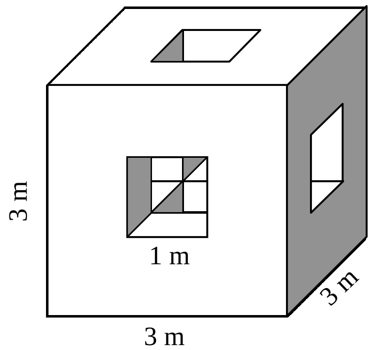


PART C: (Each correct answer is worth 7 marks)

15. Which of the following statements is TRUE with regard to a circle?

(A) The area is sometimes numerically larger than the circumference.
(B) The area is always numerically larger than the circumference.
(C) The area and circumference are never numerically the same.
(D) When the circumference of a circle doubles then the area also doubles.
(E) The circumference is always numerically larger than the area.

16. A solid cube with 3 metre side lengths has square holes cut through it from the middle of each face to the middle of the opposite face, as shown. The three holes intersect in the middle of the cube. The square windows so produced have side lengths of 1 metre each. What is the total surface area, in square metres, of the new solid?



(A) 72 (B) 76 (C) 78 (D) 80 (E) 84

17. A woman arrives at the station at the same time every day. Her husband drives from home to the station to pick her up. They always arrive back at their house at the same time every day, driving at the same speed. One day she arrives at the station one hour early and starts to walk home. Her husband meets her along the road and they drive home together. They arrived home 10 minutes earlier than usual. Assuming all speeds of walking and driving are constant and all transfers are immediate, how long had the woman been walking when her husband met her? (answer in minutes)

(A) 10 (B) 50 (C) 55 (D) 70 (E) 90

18. What is the unit digit of $2^{1999} + 3^{2000}$?

(A) 1 (B) 3 (C) 5 (D) 7 (E) 9

19. How many numbers are there in the list 1, 2, 3, 4, 5, …, 10 000 which contain exactly two consecutive 9's such as 993, 1992 and 9929 but NOT 9295 or 1999?

(A) 280 (B) 271 (C) 270 (D) 261 (E) 123

20. An ant walks around a triangle with sides 5 cm, 6 cm, and 7 cm so that it always stays 1 cm from the outside of the triangle. When it returns to its starting point for the first time, in cm, it has walked

(A) 19 (B) 21 (C) 24 (D) $18+\pi$ (E) $18+2\pi$

THE END

ANSWER POSITIONS: JUNIOR SECOND ROUND 1999

PRACTICE EXAMPLES	POSITION
1	D
2	C
3	A

NUMBER	POSITION
1	D
2	B
3	C
4	D
5	E
6	B
7	B
8	C
9	A
10	C
11	A
12	C
13	A
14	B
15	A
16	A
17	C
18	E
19	D
20	E

DISTRIBUTION	
A	5
B	4
C	5
D	3
E	3
TOTAL	**20**