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

FIRST ROUND 2000

SENIOR SECTION: GRADES 10, 11 AND 12
(STANDARDS 8, 9 AND 10)

12 APRIL 2000

TIME: 60 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 test. Each question is followed by answers marked A, B, C, D and E. Only one of these is correct.
3. Scoring rules:
   - 3.1 Each correct answer is worth 5 marks.
   - 3.2 There is no penalty for an incorrect answer or any unanswered questions.
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. Give your answers on the sheet provided.
7. When the invigilator gives the signal, start attempting the problems. You will have 60 minutes working time for the question paper.

DO NOT TURN THE PAGE OVER 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

PRACTICE EXAMPLES

1. If $3x - 15 = 0$, then x is equal to

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

2. The circumference of a circle with radius 2 is

(A) π (B) 2π (C) 4π (D) 6π (E) 8π.

3. The sum of the smallest and the largest of the numbers 0,5129; 0,9; 0,89; and 0,289 is

(A) 1,189
(B) 0,8019
(C) 1,428
(D) 1,179
(E) 1,4129.

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

1. A hectare is the area of a square piece of land measuring 100m by 100m. Farmer Jabulani bought a 45 hectare farm for R180 000. The price in rands per square metre paid by farmer Jabulani was

(A) 4000 (B) 400 (C) 40 (D) 4 (E) 0,40.

2. $\frac{10-9+8-7+6-5+4-3+2-1}{1-2+3-4+5-6+7-8+9} =$

(A) -1 (B) 1 (C) 5 (D) 9 (E) 10.

3. The number halfway between $\frac{1}{8}$ and $\frac{1}{10}$ is

(A) $\frac{1}{80}$ (B) $\frac{9}{40}$ (C) $\frac{1}{18}$ (D) $\frac{1}{9}$ (E) $\frac{9}{80}$.

4. Which of the following numbers is the largest? (Remember $6,\overline{967}$ means $6,967967967\ldots$)

(A) $3,1416$ (B) $3,\overline{1416}$ (C) $3,1\overline{416}$ (D) $3,14\overline{16}$ (E) $3,141\overline{6}$.

5. If $\frac{x}{y} = 0,75$, then the value of $(x+2y)/x$ equals

(A) $\frac{11}{3}$ (B) $\frac{3}{11}$ (C) $\frac{11}{8}$ (D) $\frac{8}{3}$ (E) Cannot be determined.

6. If $f(x) = 2x-1$ and $g(x) = \frac{1}{x}$, then $f(g(-\frac{1}{2}))$ equals

(A) 0 (B) -5 (C) $-\frac{1}{2}$ (D) 2 (E) 5.

7. If $p+q=4$ and $p^2-q^2=1$, then $p-q$ equals

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

8. Ixopo General Dealer sells fish. This can be bought in three kinds of packets:
A 400g packet at R10,00 each
A 500g packet at R13,00 each
A 800g packet at R16,00 each.
You want to buy 2kg of fish, which can be done in different ways.
The difference, in rands, between the most expensive combination and the cheapest combination will be

(A) 10 (B) 12 (C) 8 (D) 4 (E) 14.

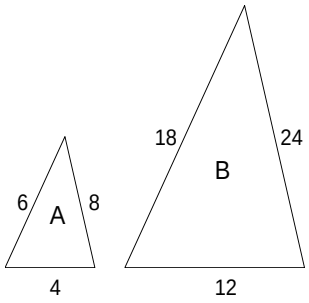
9. Telkom plans to install 732 000 new telephone lines in the year 2000. On average the new lines will be installed at the rate of approximately

(A) One every second (B) One every 5 seconds (C) One every 6 minutes
(D) One every 45 seconds (E) One every 60 minutes.

10. The average of three numbers is 18. If the largest number is replaced by the number 38, then the average of the three numbers is 23. The original number that was replaced, is

(A) 38 (B) 23 (C) 15 (D) 18 (E) 33.

11. Two triangles, with given side lengths, are shown. To paint triangle A you need 4 ml of paint. The number of ml of paint needed for triangle B is

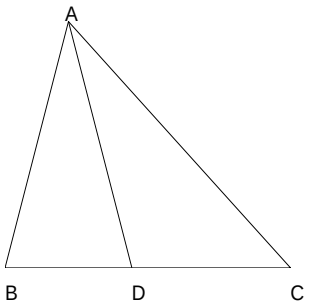


(A) 12 (B) 18 (C) 24 (D) 36 (E) 48.

12. A question paper consists of twenty questions. Section A (questions 1 to 5) are worth 3 marks each, Section B (question 6 to 15) are worth 5 marks each and Section C (questions 16 to 20) are worth 7 marks each. Ellie scores 100% in section A, and 90% in section B. The least number of questions she should answer correctly in section C to score more than 80% overall is

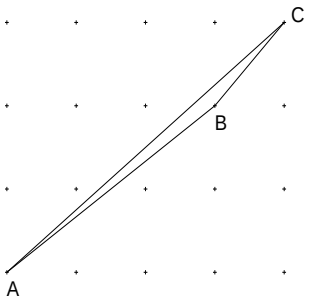
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5.

13. In the given figure, ABD is an equilateral triangle. If the area of triangle ABC is twice the area of triangle ADC, then the size of angle BAC is equal to



(A) 90^o (B) 120^o (C) 60^o (D) 105^o (E) 72^o.

14. The horizontal and vertical distance between adjacent points of the grid shown, is one unit. The area of the triangle ABC is



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

15. In a certain school there are two grade 11 classes with the same number learners in each. The ratio of girls to boys in one class is 1 : 2 and in the other class it is 3 : 2. The ratio of girls to boys in the entire grade 11 is

(A) 1 : 1 (B) 5 : 3 (C) 7 : 8 (D) 8 : 7 (E) 3 : 5.

16. In a science experiment, you are trying to separate sugar from a solution of water and sugar by heating and evaporating the water. The mass of the solution is 2kg which contains 90% water and 10% sugar by mass. What will be the mass of the solution if after some time you find it to contain 85 % water?

(A) 1,9 kg (B) 1 kg (C) 1,7 kg (D) $1,\overline{3}$ kg (E) 1,5 kg.

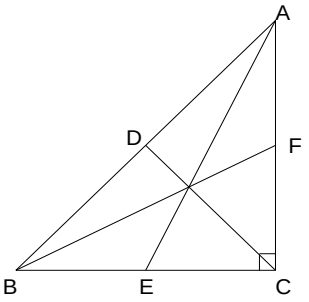
17. The sum of the digits of $10^{20} - 2$ when expressed as a single number is

(A) 180 (B) 3 (C) 171 (D) 170 (E) 179.

18. Mr. and Mrs. Mahomole, working in shifts, made an agreement with their employer that Mr. Mahomole will be off every 8th day and Mrs. Mahomole every 5th day. If they were both off on Thursday the 20th of January 2000, on what date will they be off together the last time during year 2000?

(A) 25 December (B) 5 December (C) 10 December (D) 26 November (E) 26 October.

19. ABC is a right angled triangle with D, E and F the mid-points of the sides as indicated. If $CD = 2$ then $AE^2 + BF^2$ equals



(A) 12 (B) 5 (C) 15 (D) 20 (E) 25.

20. When written in full 2^{2000} has m digits and 5^{2000} has n digits. The value of $m + n$ is

(A) Less than 1999 (B) 1999 (C) 2000 (D) 2001 (E) More than 2001.