

THE SOUTH AFRICAN MATHEMATICS OLYMPIAD

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

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SECOND ROUND 1998
JUNIOR SECTION: GRADES 8 AND 9
26 MAY 1998
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.**

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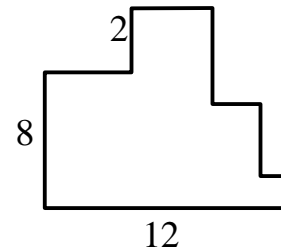
PART A: (Each correct answer is worth 3 marks)

1. The value of $5 \times 4 \times 3 \times 2 - 5 \times 4 \times 3$ is

(A) 1 (B) 2 (C) 20 (D) 60 (E) 120

2. The polygon has sides which meet at right angles. Side lengths are as shown. The perimeter of the polygon is

(A) 44 (B) 34 (C) 32
(D) 22 (E) impossible to find.

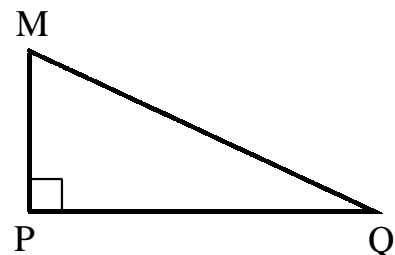


3. If $a \odot b = ab + \frac{a}{b}$, then $6 \odot 2$ is equal to

(A) 39 (B) 15 (C) $12\frac{1}{3}$ (D) 12 (E) 11

4. In the diagram $\hat{P} = 90^\circ$ and $PQ = 8$ cm. If the area of $\triangle MPQ$ is 24 cm^2 , then the perimeter of the triangle in cm is

(A) 24 (B) 40 (C) 18
(D) 54 (E) 48



5. In an orchard with m orange trees, every tree produced p oranges. Some oranges were lost due to a hailstorm and $\frac{3}{4}mp$ oranges remained. The percentage of oranges lost was

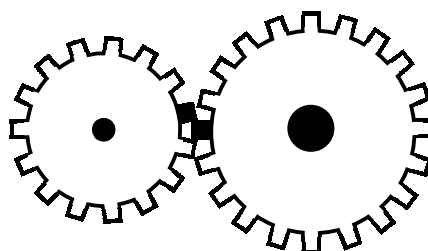
(A) 75 (B) 40 (C) 30 (D) 25 (E) 10

6. One day I noticed that my newspaper had 24 pages and that page 6 and page 20 were on the same double sheet. Which other pages were also on this sheet?

(A) 7 & 19 (B) 5 & 21 (C) 5 & 19 (D) 7 & 21 (E) 8 & 22

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

7. Two gears, one with 15 teeth and the other one with 20 teeth, fit together as shown in the figure. Each has a marked tooth as indicated. After how many rotations of the gear with 15 teeth will the marked tooth be together again for the first time?



- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
8. Which one of the following is not a prime number?
- (A) $2^2 - 2 + 1$ (B) $2^3 - 2^2 + 2 - 1$
(C) $2^4 - 2^3 + 2^2 - 2 + 1$ (D) $2^5 - 2^4 + 2^3 - 2^2 + 2 - 1$
(E) $2^6 - 2^5 + 2^4 - 2^3 + 2^2 - 2 + 1$
9. The length and width of a rectangle are both doubled. When the new rectangle is compared to the original rectangle
- (A) the area and the perimeter are unchanged.
(B) the area and the perimeter are both doubled.
(C) the area is 4 times the original area and the perimeter is doubled.
(D) the area is doubled and perimeter is 4 times as large as the original perimeter.
(E) the area and the perimeter are both 4 times as large as the original area and perimeter.

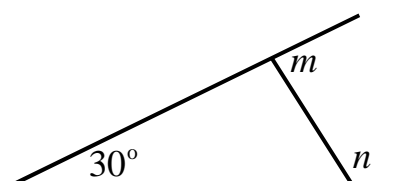
10. A fruit vendor makes a display with her peaches in a pyramid structure. The pyramid has a square base. She manages to make a display six layers high. The number of peaches she needs for this display is



(A) 21 (B) 84 (C) 91 (D) 72 (E) 36

11. In the diagram the angle m is $\frac{2}{3}$ the size of n .
The value of m is

(A) 75° (B) 60° (C) 54°
(D) 96° (E) 84°

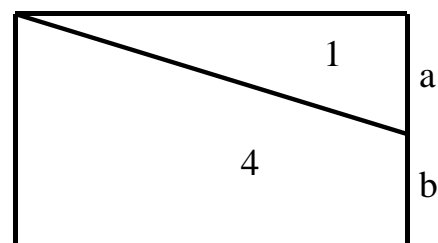


12. My teacher had 3 big boxes of sweets. One box contained red sweets, one green and one yellow. Each learner was given 5 sweets of two different colours. Every learner in the class received a different combination of colours. What was the maximum number of learners that could have been in the class?

(A) 10 (B) 12 (C) 15 (D) 18 (E) 60

13. In the diagram, the sloping line divides the area of the rectangle in the ratio 1 : 4.
What is the ratio $a : b$?

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

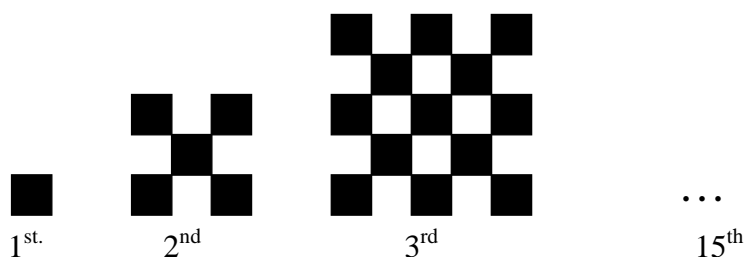


14. The remainder when 3^{1998} is divided by 5 is

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

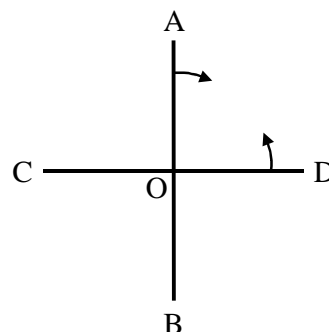
PART C: (Each correct answer is worth 7 marks)

15. How many black tiles will be required to build the 15th figure in the given pattern?



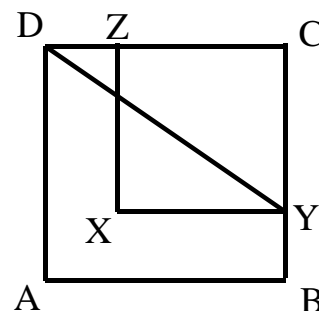
- (A) 403 (B) 365 (C) 481 (D) 421 (E) 225

16. Two lines AB and CD intersect at 90° in O and start rotating around O in different directions as shown. AB rotates at one revolution every two minutes and CD at three revolutions a minute. After how many seconds will the lines be concurrent (i.e. on top of each other) for the first time?



- (A) 13 (B) $4\frac{1}{11}$ (C) $4\frac{2}{7}$ (D) $5\frac{2}{3}$ (E) 6

17. ABCD and XYCZ are squares. The area inside square ABCD, but outside square XYCZ is 30 square units. If $DY = 10$, then the length of CD is

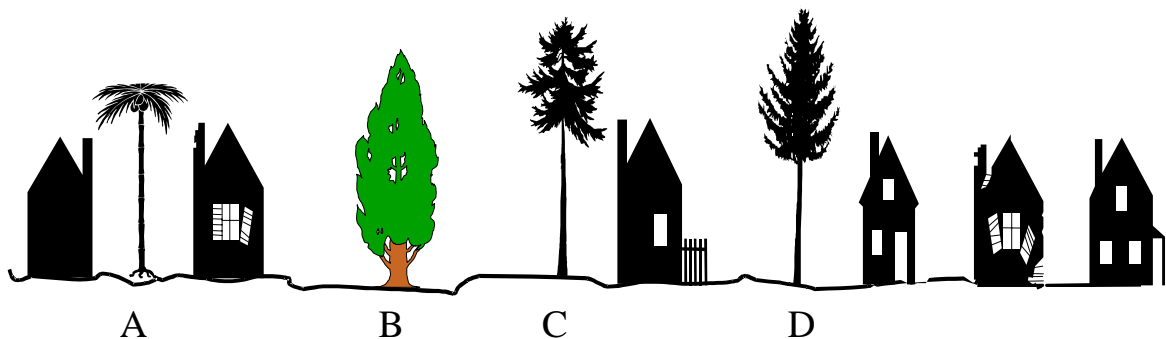


- (A) $\sqrt{35}$ (B) $\sqrt{65}$ (C) $\frac{\sqrt{130}}{2}$
 (D) $\sqrt{10}$ (E) 8

18. Danie has three types of marbles: small, medium and large. He finds that 18 small marbles and 6 medium marbles weigh as much as 5 large marbles. He also finds that 2 medium marbles and 1 large marble weigh as much as 10 small marbles. The number of small marbles that weigh as much as 1 large marble is

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

19. The houses and trees in the diagram are all in a straight line. In each of the six houses lives a child. At which tree should the children meet so that the sum of the distances they walk to that tree is a minimum?



(A) A (B) B (C) C (D) D (E) Impossible to determine.

20. Three girls A, B and C run in a 100 m race. When A finishes, B is 10 m behind A and when B finishes C is 20 m behind B. How far in metres was C from A when A finished?
(Let's assume all the athletes run at a constant speed)

(A) 30 (B) 29,5 (C) 29 (D) 28,5 (E) 28

THE END

ANSWER POSITIONS: JUNIOR SECOND ROUND 1998

PRACTICE EXAMPLES	POSITION
1	D
2	C
3	A

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

DISTRIBUTION	
A	3
B	4
C	4
D	6
E	3
TOTAL	20

Password: samo