FEMSSISA MATHEMATICS OLYMPIAD: Grade 8 - 12

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

SA OLYMPIADS

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MATHEMATICS OLYMPIAD
GRADE TWELVE

DATE: 4 – 5 AUGUST 2026
TIME: 90 MINUTES

INSTRUCTIONS:

1. This booklet has 15 multiple choice and 5 open ended questions.
2. Use the answer sheet provided. Circle the letter corresponding to your answer.
3. All working details must be done in the space provided.
4. Calculators are not permitted.
5. Diagrams are not necessarily drawn to scale.
6. The first 15 problems carry 1 mark each and the next 5 carry 2 marks each.
7. You have 90 minutes for the paper which works out to an average of 4.5 minutes per question.
8. Read the questions carefully before answering.
9. Visit the website: www.saolympiads.co.za.

ENJOY THE OLYMPIAD!

GRADE TWELVE

SECTION A: MULTIPLE CHOICE (Questions 1 – 15, 1 mark each)

1. If the sum to n terms of the following arithmetic series is equal to 1248 then find n?
6; 10; 14; 18; ….
(A) -26 (B) 26 (C) 24 (D) 24 or -26

2. Write down the period of f, if f = $\left\{(x;y): y = \tan\frac{1}{2}x; x \in [-360^0; 360^0]\right\}$
(A) 270^0 (B) 360^0 (C) 180^0 (D) 150^0

3. Determine the values of k for which the equation has 2 real roots:
x = $4 \pm \sqrt{6k^2 - 11k + 3}$
(A) $k \leq \frac{1}{3} or\ k \geq \frac{3}{2}$ (B) $k \leq \frac{1}{3}$
(C) $k < \frac{1}{3}\ or\ k > 3$ (D) $\frac{-1}{2} < k < 3$

4. Write down the amplitude of g if g = $\{(x;y): y = -3\sin x - 2; x \in [-360^0; 360^0]\}$
(A) 3 (B) -3 (C) 2 (D) 5

5. Rewrite h given by y = - $3x^2$ + 6x +4 in the form:
y = $a(x-p)^2 + q$
(A) y = -3$(x - \frac{3}{4})^2 - 7$ (B) y = -3$(x - \frac{3}{2})^2 + 7$
(C) y = -3$(x + 1)^2 + 7$ (D) y = -3$(x - 1)^2 + 7$

6. Solve for x:
$4x^3$ - $16x^2$- 9x +36 = 0
(A) $x = \frac{3}{2};\ 2;\ 4$ (B) $x = \frac{-3}{2};\ \frac{3}{2};\ 4$
(C) $x = -\frac{3}{2};\ -2;\ 4$ (D) $x = \frac{3}{2};\ -2;$

7. The equation of the tangent to the curve y = $\frac{3-x}{x}$ at (1; 2) is…….
(A) y=-3x+5 (B) y=3x+5 (C) y= x+5 (D) y=2x-5

8. Determine: $\frac{dx}{dy}\ if\ y = \frac{p}{x-3}\ and\ p = y + 2$
(A) $\frac{1}{x^2}$ (B) 1 + $\frac{1}{y^2}$
(C) $\frac{1}{y^2}$ (D) $\frac{-2}{y^2}$

9. Solve for 'x' :
$$\sqrt{2x+3} - \frac{1}{\sqrt{2x+3}} = \frac{8}{3}$$
(A) $x = \frac{-8}{9}$ (B) $x = -3$
(C) $x = 3$ (D) $x = 3\ or\ \frac{-8}{9}$

10. If $\tan\theta = \frac{-12}{5}$ and $\theta \in [90^o;270^o]$.

Then calculate:

$$\frac{1}{\cos(\theta - 270^o)}$$

(A) $\frac{12}{13}$ (B) $\frac{13}{-5}$

(C) $-\frac{13}{12}$ (D) $\frac{13}{5}$

11. Determine the coordinates of the point of inflection of:

$y = x^3 - 6x^2 - 5x + 12$

(A) (2;-14) (B) (-2;14) (C) (-2;-14) (D) (2;14)

12. Solve for x:

$$\frac{5}{2-x} \leq -1$$

(A) $2 \leq x \leq 7$ (B) $x \leq 2 or\ x \geq 7$

(C) $x > 7$ (D) $2 < x \leq 7$

13. Write as a single ratio:

$$\frac{1}{\tan x} - \frac{\cos 2x - \cos x}{\sin 2x + \sin x}$$

(A) $\frac{1}{\cos x}$ (B) $\frac{1}{\sin x}$

(C) sin x (D) $\cos x$

14. A factory can produce 1000 chairs per week and sell them at R600 each. For each decrease of R20 per chair, 100 more chairs are sold.
At what price must each chair be sold to maximise receipts (sales)?

(A) R320 (B) R360 (C) R400 (D) R440

15. Consider the series

$$\frac{x+1}{2} + \frac{3(x+1)}{2(x-3)} + \frac{3(x+1)}{2(x-3)^2} + \cdots \ldots$$

For what values of x does the series converge?

(A) $x < 0$ (B) $0 < x < 3$

(C) $x > 3$ (D) $x < 0\ or\ x > 6$

SECTION B: OPEN ENDED (Questions 16 – 20, 2 marks each)

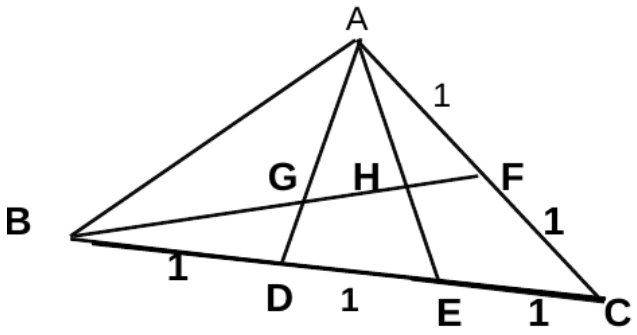
16. The number y = 64 x 63 x 62 x 61 x…..x4 x 3 x 2 x 1 is divided by 2^n
Give the maximum value of n such that y is divisible by 2^n

17. If $3^a = 15^c$ and $5^b = 15^c$ then write down a in terms of b and c.

18. 7 learners seated next to each other. A and G are fixed at the beginning and the end respectively.
B and F are not next to A and G respectively. In how many ways can all the learners be seated?

19. 9 blue blocks and 6 green blocks are placed in a bag. A block is drawn at random and not replaced. A second and third block are randomly drawn in the same way. What is the probability of drawing at least 1 blue block?

20. ABC is a triangle. AD and AE divide BC in the ratio 1:1:1.
BF divides AC in the ratio 1:1 A
What is the ratio of BG:GH:HF?



MARKS: 1–15: 15 × 1 = 15
16–20: 5 × 2 = 10
TOTAL: 25