FEMSSISA MATHEMATICS OLYMPIAD: Grade 8 - 12

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MATHEMATICS OLYMPIAD GRADE TEN

DATE: 5 AUGUST 2024 – 8 AUGUST 2024

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 Ten Mathematics Olympiad

1. Simplify

   $(-3xy)^2 \times \sqrt{16x^2y^4}$

   (A) $36x^3y^4$ (B) $24x^3y^4$ (C) $12x^3y^4$ (D) $-36x^3y^4$

2. Simplify

   $$\frac{3x^2 + x - 10}{12x^2 - 11x - 15}$$

   (A) $\frac{x-2}{4x+3}$ (B) $\frac{x+2}{4x-3}$ (C) $\frac{x+2}{4x+3}$ (D) $\frac{2x+1}{4x+3}$

3. Solve for x and y:

   $7x - 6y = 17$

   $2x + 3y = 19$

   (A) (6;-3) (B) (-6;3) (C) (5;3) (D) (5;-3)

4. The equation of the line parallel to 2x +y + 6 = 0 and passing through P(-2; 1) is…

   (A) y = 2x - 3 (B) y = -2x - 3 (C) y = -2x + 3 (D) y = -3x + 2.

5. What is the units digit of:

   $12^{50} \times 3^{50}$

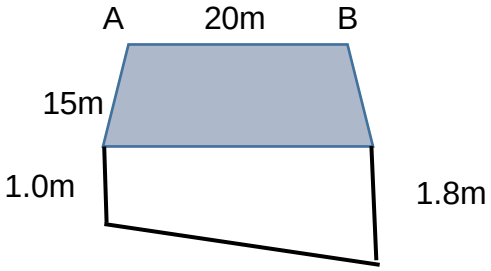
   (A) 3 (B) 4 (C) 5 (D) 6

6. Solve for x:

$9^4 + 27^2 = 10.3^x$

(A) 1 (B) 6 (C) 5 (D) $6 \ or \ 1$

7. A rectangular swimming pool has dimensions measuring 20m by 15m. The shallow end is 1.0 m and 1.8m in the deep end. The cross section is a trapezium. Determine the area of the side walls of the pool in m^2.



(A) 96 (B) 98 (C) 104 (D) 108

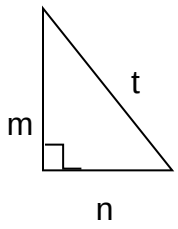
8. 120000 tickets for a cricket match were sold at R200 and R500 each. The revenue realized was R36 million. How many R500 tickets were sold?

(A) 40000 (B) 50000 (C) 60000 (D) 70000

9. If t = $\frac{1}{2+m}$ and m = $\frac{1}{4+n}$ then write n in terms of 't'.

(A) $\frac{4+9t}{2t-1}$ (B) $\frac{4-9t}{2t+1}$ (C) $\frac{4-9t}{2t-1}$ (D) $\frac{4+9t}{2t+1}$

10. In the right-angle triangle alongside, m + n = 12 and t = $6\sqrt{2}$. Calculate the area of the triangle in square units independent of m and n.



(A) 12 (B) 14 (C) 16 (D) 18

11. Write in its simplest form:

$$\frac{5}{(y+1)(2y-3)} - \frac{1}{y(y+1)} + \frac{3}{y(2y-3)}$$

(A) $\frac{6}{y(2y-3)}$ (B) $\frac{6}{y(2y+3)}$ (C) $\frac{6}{y(y+1)}$ (D) $\frac{4}{y(2y-3)}$

12. Evaluate: $99^2 - 96^2 + 93^2 - 90^2 + 87^2 - 84^2 + \ldots + 15^2 - 12^2$

(A) 4880 (B) 4995 (C) 5115 (D) 5350

13. Evaluate: $24\frac{5}{6} \times 29\frac{7}{8}$

(A) 741 (B) $731\frac{43}{48}$ (C) $741\frac{43}{48}$ (D) $751\frac{43}{48}$

14. Write down the ordered pair (x;y) which is the common solution of both equations:

$$\frac{3}{2x+1}+\frac{2}{3y+1}=1 \text{ and } \frac{-6}{2x+1}+\frac{2}{1+3y}=4$$

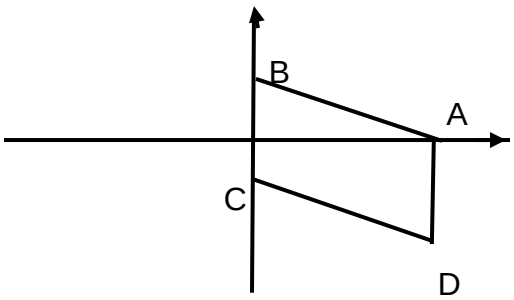
(A) (1;0) (B) (0;-1) (C) (-2;0) (D) (0;1)

15. In a warehouse there are 200 cars which are automatics or manuals. Each car is either blue or white.
In addition, we have the following information:
- 120 are blue cars,
- 50 automatics are white.

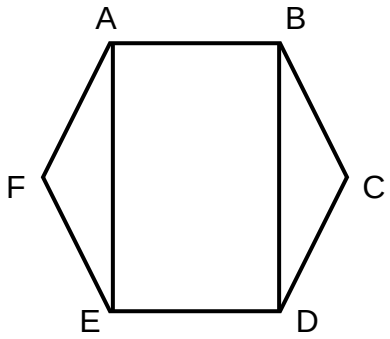
How many manuals are white?

(A) 30 (B) 40 (C) 50 (D) 60

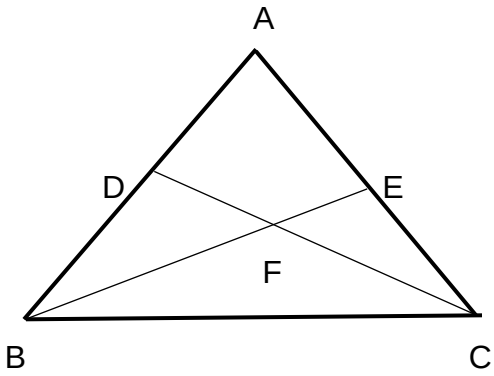
16. B and C are the y-intercepts and A is the x-intercept of parallelogram ABCD. The equation of AB is $y = \frac{-2}{3}x + 2$ and BC = 6. Determine the co-ordinates of D.



17. In the following regular hexagon ABCDEF, the area of ABCF = 48 $(\sqrt{3})$cm^2, Determine the length of AB in cm.



18. In Δ ABC , D and E are points on AB and AC respectively. CD and BE meet at F such that the area of ADFE = ΔDFB = x. Area of ΔBFC = 8 and ΔCFE =2. Determine x.



19. Two cyclists, each cycling at their own constant speeds around an cycling track complete one lap in 4 minutes and 6 minutes respectively travelling in opposite directions. If they start together from the same starting point and in the opposite directions then how many times will they pass each other in 1 hour?

20. A bag has 8 blue discs and x white discs. Disc one was chosen at random and not replaced. Disc two was chosen at random. If the probability of choosing a blue followed by a white disc is $\frac{8}{33}$ then determine the value of x if $x < 8$.

MARKS: 1-15: 15 X 1 = 15
16-20: 5 X 2 = 10
TOTAL = 25