SOUTHERN AFRICAN SENIOR MATHEMATICS OLYMPIAD FEMSSISA

GRADE 10

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DATE: 15 – 19 AUGUST 2022

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 one 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 websites: www.saolympiads.co.za.

ENJOY THE OLYMPIAD.

Grade Ten Mathematics Olympiad 2022

1. $If\ x = \frac{-b+\sqrt{b^2-4ac}}{2a}$ a = 2; b = 5; c = −12 $then$ the $value\ of\ x\ is$.....

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

2. If f(x) = $3x^2$ - 4x then the simplification of $\frac{f(x+h)-f(x)}{h}$ if $h \neq 0$ is equal to …

   (A) 6x + 3h - 4 (B) 6x - 4 (C) 6x + 3h (D) 3x+3h - 4

3. The table below shows the relationship between x and y which is in the form: $y = \frac{x+a}{x+b}$ then $a + b\ is$ … …

x	4	0
y	0	-1

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

4. The equation of the line perpendicular to x - 4y + 8 = 0 and passing through P(-4; 2) is…

   (A)y = -4x - 14 (B)y = -4x + 14 (C)y = 4x – 14 (D)y = 4x + 14

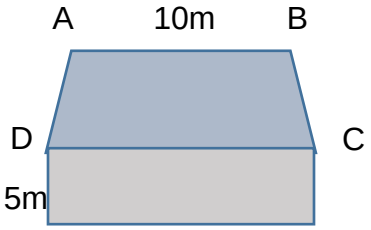
5. Factorize: $(2x + 1)^3 – (1 –3x)^3$

   (A) $5x^2(7x^2+ 1)$ (B) $5x^2(7x^2- 7x + 1)$ (C) $5x^2(7x^2- 5x + 1)$ (D) $5x^2(7x^2+ 5x + 1)$

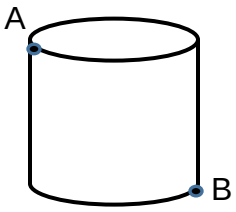
6. Two towns Valley View and Lily are 250 km apart. Two cars A and B leave Valley View and Lily at different times travelling in opposite directions and meet after 120 minutes. Car A leaves 1 hour later and travels at a speed of 40km faster than car B. Determine the speed of car A in km/h.

   (A) 70 (B) 90 (C) 100 (D) 110

7. A right rectangular structure has a trapezium shaped roof with AB = 10m and DC = 22m and a uniform lateral height of 5m. If the volume is 640m^3 then determine the perimeter in metres of ABCD.



(A) 52 (B) 56 (C) 60 (D) 64

8. 

The diagram represents a circular cylinder of circumference 32cm and a height of 12cm. A is a point on the top of the rim and B diametrically opposite A. Determine the shortest distance in cm between A & B.

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

9. Solve for x:

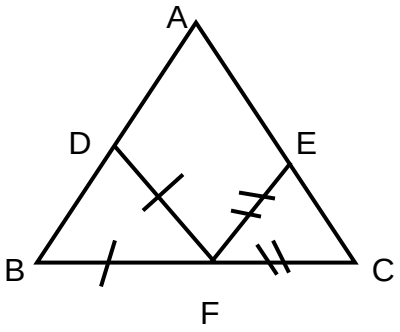
$$\frac{3x-1}{3} = \frac{1}{2x+5}$$

(A) $\frac{1}{2}$ $only$ (B) $\frac{1}{2}$ or $\frac{-8}{3}$ (C) $\frac{-8}{3}$ $only$ (D) $\frac{1}{2}$ or $x = -3$

10. If v = $\sqrt{2ke+m}$ then k =……..

(A) $\frac{v^2-m}{2e}$ (B) $\frac{v^2+m}{2e}$ (C) $\frac{m-v^2}{2e}$ (D) $\frac{v^2-m}{e}$

11.



In ΔABC; D; E and F are on AB; AC and BC respectively such that DE = BF and EF = FC. D$\hat{E}$ F = 70^0. Calculate the measurement of $\hat{A}$.

(A) 45^0 (B) 55^0 (C) 60^0 (D) 65^0

12. Write in its simplest form:

$$\frac{2}{(3x+2)(3x-2)} - \frac{3}{x(2-3x)} + \frac{3}{x(3x+2)}$$

(A) $\frac{20}{x(3x-2)}$ (B) $\frac{20x}{(3x+2)(3x-2)}$ (C) $\frac{20}{(3x+2)(3x-2)}$ (D) $\frac{20}{x(3x+2)}$

13. Evaluate: $59^2 - 57^2 + 55^2 - 53^2 + 51^2 - 49^2 + \ldots + 7^2 - 5^2$

(A) 1668 (B) 1676 (C) 1684 (D) 1692

14. Evaluate: $29\frac{4}{5} \times 20\frac{1}{6}$

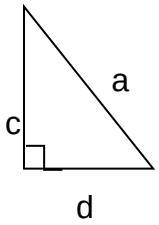
(A) $599\frac{14}{15}$ (B) $601\frac{29}{30}$ (C) $600\frac{29}{30}$ (D) $600\frac{14}{15}$

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

$$\frac{4}{2x-3} + \frac{7}{2y-1} = 3 \quad \text{and} \quad \frac{5}{2x-3} + \frac{21}{1-2y} = 2$$

(A) (2;-4) (B) (4;2) (C) (2;4) (D) (-2;4)

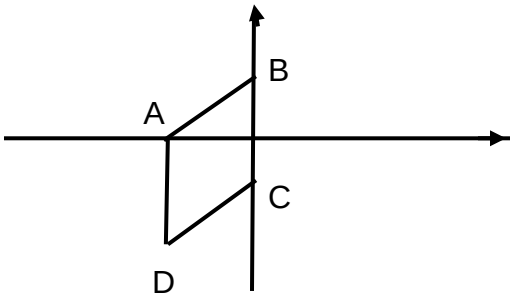
16. In the right-angle triangle alongside c + d = 19 and a = $\sqrt{185}$. Calculate the area of the triangle independent of c and d.



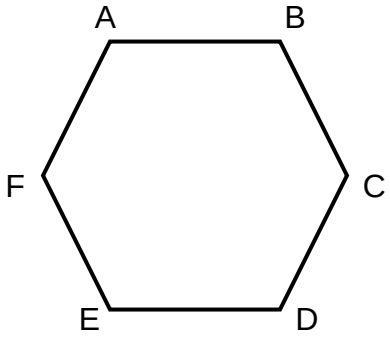
17. At a party there were 110 who were either female or male. Each person could dress in either blue or green.
In addition, we have the following information:
    - 35 are green dressed males,
    - 50 are females,
    - 45 are dressed in blue.

    How many females are dressed in green?

18. B and C are the y-intercepts and A the x-intercept of rhombus ABCD. The equation of AB is y = $\frac{3}{4}$x + 3. Determine the area of the rhombus ABCD in square units.



19. In the following regular hexagon ABCDEF the area of ABF = $16(\sqrt{3})$cm^2, Determine the area of ABCDEF in cm^2.



20. At 2 o'clock the angle between the hour hand and the minute hand is 60^0. At what next time will the minute hand coincide with the hour hand?

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