SOUTHERN AFRICAN JUNIOR MATHEMATICS OLYMPIAD

FEMSSISA
(SAJMO)
GRADE EIGHT

DATE: 30 – 31 AUGUST; 1-10 SEPTEMBER 2021

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.
3. Calculators are not permitted.
4. Diagrams are not necessarily drawn to scale.
5. The first 15 problems carry one mark each and the next 5 carry 2 marks each.
6. You have 90 minutes for the paper which works out to an average of 4.5 minutes per question.
7. Read the questions carefully before answering
8. Visit the website: www.saolympiads.co.za.

REGISTRATION NO: 2015/050119/08

Grade Eight Mathematics Olympiad 2021

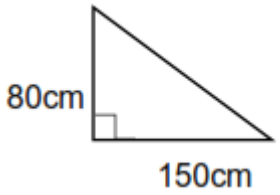
1. What is the value of: 30 x 22 – 22 x 17 – 22 x 8?

(A) 100 (B) 110 (C) 120 (D) 220

2. If $\frac{2}{7}$ of the bags produced by a manufacturer in a week is 6000 then find what is $\frac{1}{3}$ of the number of the bags?

(A) 7000 (B) 7200 (C) 7500 (D) 7800

3. Determine the perimeter of the triangular shelf bracket in cm.

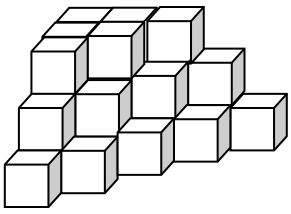


(A) 170 (B) 200 (C) 300 (D) 400

4. For what values of n will 352n is divisible by 12?

(A) 2 (B) 4 (C) 8 (D) 9

5. Identical cubes are stacked in the corner as shown. How many cubes must be added to form one large 5 by 5 by 5 cube?



(A) 99 (B) 94 (C) 89 (D) 85

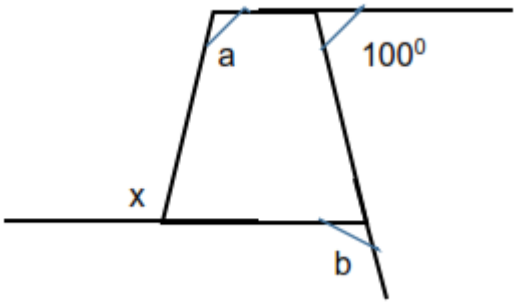
6. Consider the following sequence:

2
4 6
8 10 12
……

What is the 2nd number from the left of the 21st row?

(A) 420 (B) 422 (C) 424 (D) 428

7. Find the value of x if a - b = 30^0 and all the sides of the quadrilateral are produced.



(A) 110^0 (B) 120^0 (C) 130^0 (D) 140^0

8. Two different numbers from a set of natural numbers from 7 to 21 (15 consecutive numbers) are selected such that the sum is always divisible by 7. What is the least number of numbers that must be removed such that no two numbers is divisible by 7?

(A) 6 (B) 7 (C) 8 (D) 9

9. Find the sum of the digits of:

$$\underbrace{(999\ldots999}_{20\text{ digits}} \times \underbrace{444\ldots444)}_{40\text{ digits}} \div \underbrace{(111\ldots111}_{20\text{ digits}} \times \underbrace{222\ldots222)}_{20\text{ digits}}$$

(A) 8 (B) 9 (C) 12 (D) 18

10. Evaluate:

$$36\frac{2}{5} \times 15\frac{5}{9}$$

(A) $566\frac{2}{9}$ (B) $566\frac{1}{9}$ (C) 566 (D) $566\frac{2}{9}$

11. If the sum of half an angle's complement and its supplement is 195^0 then find the value of the angle.

(A) 10^0 (B) 15^0 (C) 20^0 (D) 35^0

12. An ant travels alongside a regular pentagon with side measuring 4m and always keeping 1 m from the side of the pentagon. What distance would the ant have travelled in metres when it returns to the original position? $\pi = \frac{22}{7}$

(A) $29\frac{1}{7}$ (B) $29\frac{3}{7}$ (C) $29\frac{5}{7}$ (D) 29

13. Find the value of:

146 -144+142-140+.....+ 10 - 8.

(A) 70 (B) 76 (C) 80 (D) 84

14. Given $\frac{1}{a} + \frac{5}{b} = \frac{2}{3}$ such that a:b = 1:3 then find the value of a + b.

(A) 10 (B) 12 (C) 14 (D) 16

15. 64 one cm white cubes are assembled to form one large cube. If three of the adjacent faces are painted green then how many one cm cubes will have at least 2 green faces?

(A) 8 (B) 9 (C) 10 (D) 11

16. What is the smaller angle between the hour hand and the minute hand of an analogue clock when the time is 4.20 pm?

17. For what integral value of n will the following expression have the lowest positive integral value?

$$\frac{4n + 32}{n + 4}$$

18. 9 litres of a container has 40% concentrate. How many litres of concentrate must be added so that the mixture has 50% concentrate?

19. Evaluate:

$$\frac{2}{3x5} + \frac{2}{5x7} + \frac{2}{7x9} + \cdots + \frac{2}{31x33}$$

20. 36 equal size matchsticks are used to construct rhombuses with a longer diagonal. How many such rhombuses can be constructed if all matchsticks are used each time?

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

SOUTHERN AFRICAN JUNIOR MATHEMATICS OLYMPIAD

FEMSSISA
(SAJMO)
GRADE NINE

DATE: (30 – 31 AUGUST; 1-10 SEPTEMBER 2021)

TIME: 90 MINUTES

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REGISTRATION NO: 2015/050119/08

Grade Nine Mathematics Olympiad 2021

1. If 40% of the items manufactured is 2500 then 60% of the items is…..?

   (A) 3250 (B) 3500 (C) 3750 (D) 4000

2. If 26 July 2021 fell on Monday in 2021, then in which earliest year will 26 July fall a Monday again?

   (A) 2024 (B) 2025 (C) 2026 (D) 2027

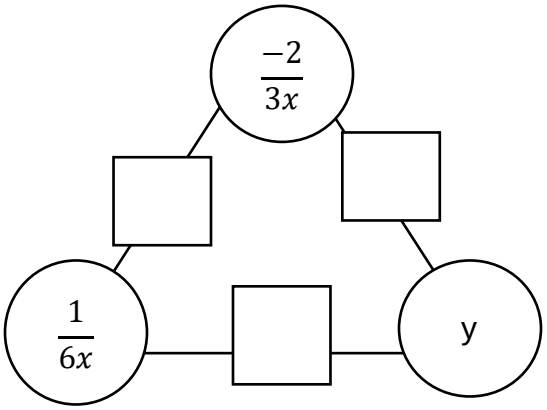
3. What is the minimum number of exercise books that can be divided equally among 9; 15 or 24 learners?

   (A) 360 (B) 300 (C) 240 (D) 3

4. The table below shows the relationship between x and y which is in the form y = mx +c. The equation is …

x	-3	1
y	-4	2

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

5. 

In the above game the sum of the two expressions in the 2 circles gives the expression in the square between them. The sum of the expressions in the 3 squares is $\frac{-1}{4x}$. Determine y in terms of x.

   (A) $\frac{1}{6X}$ (B) $\frac{-1}{6X}$ (C) $\frac{3}{8X}$ (D) $\frac{-1}{4X}$

6. The product of $(4x - y)(16x^2 + 4xy + y^2)$ is …

   (A) $64x^3+y^3$ (B) $64x^3-y^3$ (C) $16x^3+y^3$ (D) $64x^3-12x^2y+12xy^2+8y^2$

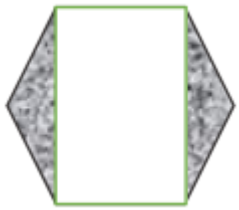
7. The sum of five consecutive numbers is ‘p-1’. The largest number in terms of ‘p’ is…

(A) $\frac{p+9}{5}$ (B) $\frac{p+7}{5}$ (C) $\frac{p+5}{5}$ (D) p + 3

8. What is the value of: 3304 x 3303 – 3305 x 3302?

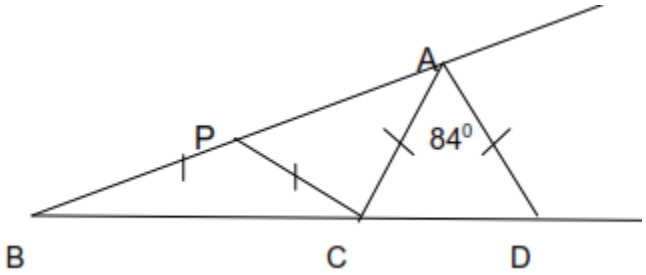
(A) 5 (B) 4 (C) 3 (D) 2

9. If the area of the non-shaded region of a regular hexagon is 4p cm^2 then determine in terms of p the area of the shaded hexagon in cm^2 is…



(A) 6p (B) $\frac{p}{2}$ (C) $\frac{p}{4}$ (D) 4p

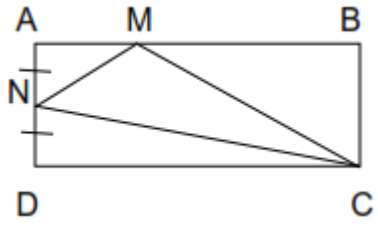
10.



In the above figure PB = PC = AC = AD. $A\hat{\hat{B}}D$ = x and $C\hat{\hat{A}}D$ = 84^0
Determine the measurement of x

(A) 32^0 (B) 24^0 (C) 16^0 (D) 8^0

11. Rectangle ABCD has M on AB such that MB is thrice AM. N is the midpoint of AD. If the area of $\Delta MNC = 25\ cm^2$ then find the area of $ABCD$ in cm^2.



(A) 60 (B) 80 (C) 100 (D) 120

12. 4 different digits x;5; 7;y are used to make 2 digit numbers with different digits. If the sum of all such 2 digit numbers is 528 then find $x + y$

(A) 9 (B) 8 (C) 6 (D) 4

13. Give the largest natural number 'n' such that M is a natural number.

$$M = \frac{9n+16}{3n+1}$$

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

14. If $(3x^2 - px + 1)(x - p) = 3x^3 - 16x^2 + 17x - 4$ then find the value of p.

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

15. Three numbers are such that the difference between any two numbers is 3; 4 and 7. If the sum of these numbers is 16 then find the smallest number.

(A) 2 (B) 4 (C) 5 (D) 9

16. Four plastic digits 3;6; 8; 9 are used to construct 3-digit numbers such that 3 cannot be the 1st digit; the number must be odd. How many different combinations are there?

17. The population of Valleyview increased by 10% in 2016. After 5 years the population decreased by 10%. The net decrease of the population was 10 000. What was the population of Valleyview before 2016?

18. A 2-digit number can be written as n times the difference of the digits. If the digits are reversed then determine in terms of n the value that the difference of the digits must be multiplied by.

19. What is the first time after 4 o' clock when the angle between the minute hand and the hour hand is 76^0?

20. Find the sum of the numbers in the 19th bracket for this arithmetic sequence.

(4;6); (8;10;12); (14;16;18;20);.....

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