science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

SOUTHERN AFRICAN JUNIOR MATHEMATICS OLYMPIAD

FEMSSISA
(SAJMO)
GRADE EIGHT
FINAL ROUND
DATE: 11 OCTOBER 2018
TIME: 120 MINUTES

Instructions:

1. **This booklet has 20 questions.**
2. **Use the answer sheet provided.**

   Write the answer in the block provided
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 120 minutes for the paper which works out to an average of 6 minutes per question.**
7. **Read the questions carefully before answering.**

Visit the website: www.femssisa.org.za

foundation for english; mathematics; sciences; sports and innovation of south africa
mathematics Innovation Sciences English sports
FEMSSISA

NON PROFIT COMPANY
REGISTRATION NO: 2015/050119/08

NRF National Research Foundation
SAASTA South African Agency for Science and Technology Advancement

FEMSSISA Grade 8 Final Round

1. **In the following addition problem find A + B + C if each digit is different**

$$\begin{array}{r} A\ B\ C \\ A\ B\ C \\ +\ A\ B\ C \\ \hline 1\ A\ 2\ 5 \end{array}$$

2. **Write down the expression that 'a' stands for:-**
   $6x^3 - 4x^2y + 8xy^2 = a(3x^2 - 2xy + 4y^2)$

3. **In how many different ways can R20 be obtained from R5; and 20c coins?**

4. **Find the value of $\frac{x^2-2x-8}{x+2}$ when x = -3 ?**

5. **Find the sum of the digits of**
   $\underbrace{(666\ldots666}_{40\text{ digits}} \times \underbrace{444\ldots444)}_{30\text{ digits}} \div \underbrace{(333\ldots333}_{40\text{ digits}} \times \underbrace{222\ldots222)}_{15\text{ digits}}$

6. **Evaluate**
   $32 \times 29\frac{1}{16}$

7. **If the difference of an angle's supplement and half its complement is 115^0 then find the angle.**

8. **Three fractions x ; y and z placed between $\frac{1}{4}$ and $\frac{9}{32}$ such that all 5 fractions are equally placed from each other. Determine x + y + z.**

9. **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 when it returns to the original position?**

10. **Find the value of:-**
    108 -106+104-102+100-.....+36 - 34.

11. **Given $\frac{2}{a} - \frac{1}{b} = \frac{5}{8}$ such that a:b = 2:3 then find the value of a x b.**

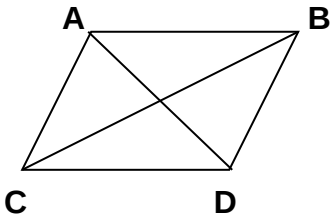
12. **When an even natural number is added to 4 it becomes a perfect square. When this even natural number is added to 52 it becomes a perfect cube. What is this number which is the smallest?**

13. **If a + 2b = 20; a + 2c = 12 then find the value of b – c.**

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

$$\frac{4n+5}{n+2}$$

15. **The area of the rhombus is 120cm^2. The shorter diagonal is 2cm less than half the longer diagonal. Find the length of one side of the rhombus.**



16. **What is the maximum number of lines of symmetry does the figure below have if A and B can be attached to create different figures?**

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

18. 64 one cm cubes with all blue faces are used to form one large cube. Five faces of the large cube are painted white. These cubes were then dismantled. How many cubes have 3 blue faces?

19. 9 litres of a 20 litre container has 40% concentrate. How many litres of water must be added so that the mixture has 70% water?

20. Evaluate.

$$\frac{1}{2x4} + \frac{1}{4x6} + \frac{1}{6x8} + \cdots . + \frac{1}{28x30}$$

TOTAL: 15 x 1 = 15
5 x 2 = 10

25

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SOUTHERN AFRICAN JUNIOR MATHEMATICS OLYMPIAD

FEMSSISA
(SAJMO)
GRADE NINE
FINAL ROUND
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FEMSSISA Grade 9 Final Round

1. Which of the following numbers is divisible by 55?

6435; 7150; 9636; 24500

2. $A = x^2 - 10x - t$. For what value of t is $(x - 2)$ a factor of the expression A?

3. Find the sum of the digits of the product 11 111 x 66 666

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

M = $\frac{8n}{n-6}$

5. If $(2x^2 - mx - 3)(x - 3) = 2x^3 - x^2 - 18x + 9$ then find the value of m.

6. A man is twice as old as his wife was when he was as old as his wife is now. He is 24 years old. How old is his wife?

7. Three numbers are such that the difference between any two numbers is 4; 5 and 9. If the sum of these numbers is 40 then find the largest number.

8. If $(t + \frac{1}{t})^2 = 6$ then find the value of $3t^2 + \frac{3}{t^2}$

9. An athletics' team has 3 long distance and 4 middle distance runners. In how many ways this team can be selected if there are 5 long distance and 6 middle distance runners?

10. Write down the unit's digit of the following problem.

$3(4^{16} + 111^{32} - 16^8)$

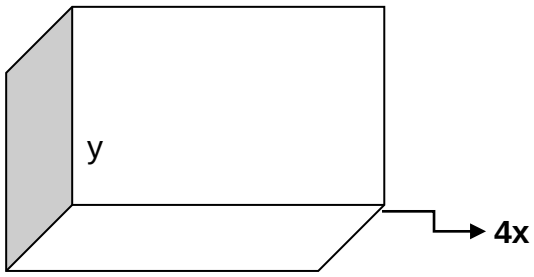
11. Write down (m + n) if $y = \frac{mx+3}{nx-2}$ passes through (1;7) and $(\frac{1}{2}; -10)$

12. a is smaller than b but greater than c. d is bigger than c but smaller than e. e is smaller than a. Which is the third largest number?

13. A 3 digit number has 2x as the hundreds digit; (x+1) as the ten's digit and (x-1) as the unit's digit. The digits are reversed. Find the difference between the two numbers in terms of x.

14. Mr. Khumalo has a variety of fish in his huge tank. At the end of the year the number of fish decreased by 10%. At the end of the following year there was a 15% increase in the fish. If the net increase is 35 fish then what was the initial number of fish in the tank

15.

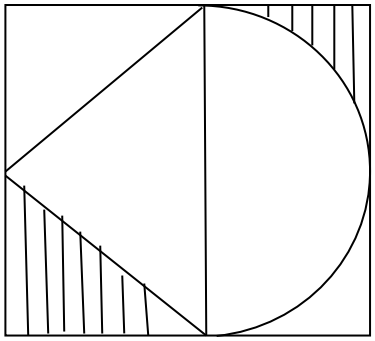


A rectangular prism has dimensions 6x units by 4x units by y units. The surface area of this prism is 288x square units. Find y in terms of x.

16. If $\frac{7}{13} = 0.\dot{5}38461\dot{}$, then determine the 80th digit after the decimal point.

17. What is the first time after 5 o' clock when the angle between the minute hand and the hour hand is 88^0 ?

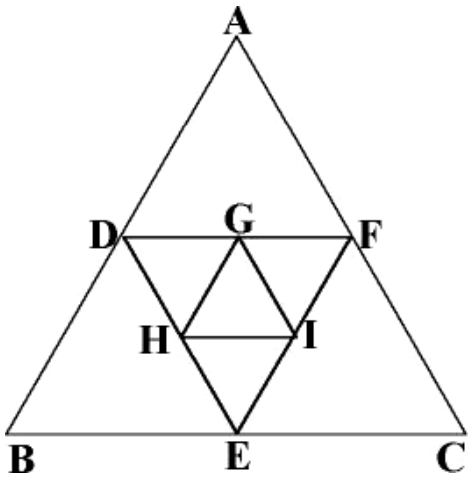
18. If the radius of the radius of the semi circle drawn inside the square is 16cm then find the area of the shaded regions.



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

(2); (4;6); (8;10;12); (14;16;18;20);.....

20. ABC is an equilateral triangle with each side = 16cm. A second triangle DEF is drawn by connecting the midpoints of the sides of triangle ABC. A third triangle is drawn in the same way. This process is continued until the 5th triangle is drawn. What fraction of the perimeter of triangle ABC is the perimeter of the 5th triangle?



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