SOUTHERN AFRICAN JUNIOR MATHEMATICS OLYMPIAD

FEMSISA MATHEMATICS OLYMPIAD

(SAJMO)

GRADE EIGHT

ROUND ONE

DATE: 4-8 JUNE 2012

TIME: 90 MINUTES

Instructions:

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

   Circle the letter corresponding to your answer.
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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.

   In order to qualify for the second round you need 7 out of 25 marks.
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Grade Eight Mathematics Olympiad 2012

1. What is the value of : 4 + 4 x 5 – 3 x 5?

(A) 25 (B) 9 (C) 185 (D) 44 (E) -15

2. What is 16% of R500 - 6% of R500?

(A) R30 (B) R40 (C) R50 (D) R60 (E) R70

3. If $\frac{2}{3}$ of the production is 480 kl then what is $\frac{1}{4}$ of the production in kl?

(A) 10 (B) 120 (C) 150 (D) 180 (E) 360

4. If the supplement of an angle is 115^0 then what is the complement of the angle?

(A) 25^0 (B) 50^0 (C) 65^0 (D) 75^0 (E) 120^0

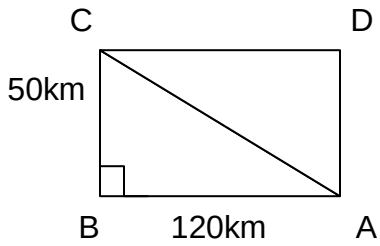
5. Which one of the following is an irrational number?

(A) $0,1\dot{3}$ (B) $2\sqrt{3}$ (C) $\sqrt[3]{8}$ (D) 1.23 (E) $0.\dot{9}$

6. What is the unit's digit of 3 x 3^{120} ?

(A) 1 (B) 3 (C) 9 (D) 7 (E) 6

7. Eric travelled from A to B ; B to C; C to A; A to D and from D to C. ABCD is a rectangle.
Calculate the distance covered by Eric.



(A) 170km (B) 300km (C) 340km (D) 470km (E) 600km

8. How many numbers between 0 and 1000 are perfect cubes?

(A) 9 (B) 10 (C)11 (D) 12 (E)1000

9. If 21 March falls on Wednesday 2012 then in which earliest year will 21 March fall on Wednesday?

(A) 2014 (B) 2015 (C) 2016 (D) 2017 (E) 2018

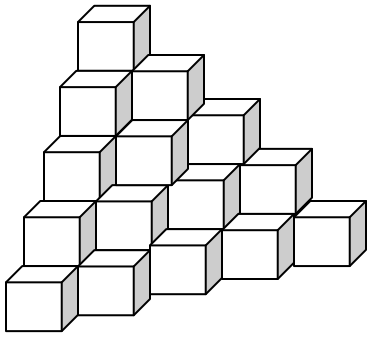
10. What is the value of
$121^2 - 120^2$

(A) 1 (B) 241 (C) 242 (D) 244 (E) 245

11. Determine the smallest 3 digit number which is exactly divisible by 12; 18 and 30.

(A) 60 (B) 90 (C)120 (D) 150 (E) 180

12. Identical cubes are stacked in the corner as shown. How many cubes are hidden?



(A) 16 (B) 18 (C) 20 (D) 22 (E) 24

13. Consider the following sequence:-

1
3 5
7 9 11
…….

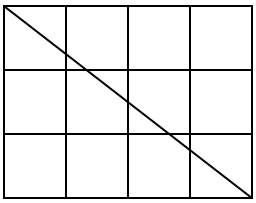
What is the 2^{nd} number of the 31^{st} row?

(A) 924 (B) 927 (C) 930 (D) 933 (E) 936

14. 23 equal size matchsticks are used to form triangles.
What is the highest number of triangles that can be formed if all matchsticks are used each time?

(A) 14 (B) 15 (C) 16 (D) 17 (E) 18

15. The rectangle is divided into equal squares. The diagonal passes through 6 squares. If the diagonal passes 69 squares of a 36 x m rectangle then what is the value of 'm'



(A) 32 (B) 33 (C) 34 (D) 35 (E) 36

16. A train 200 metre long passes through a tunnel 1.8 km long. The train travels at a speed of 80km per hour. How long , in minutes, will it take for the back of the train to exit the tunnel?

(A) 1 (B) 1.2 (C) 1.5 (D) 2.4 (E) 3

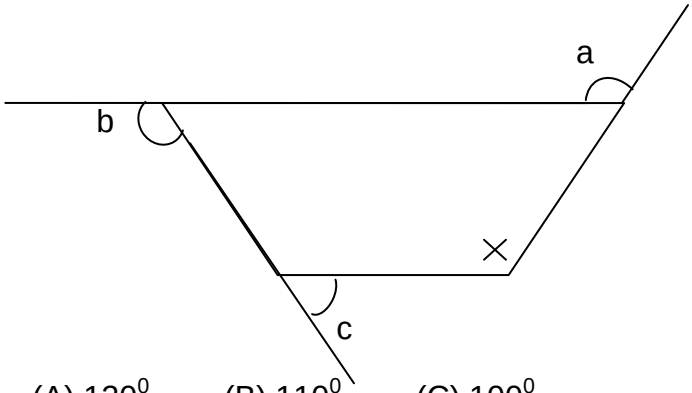
17. Consider this operation on two numbers a nd b.
a@b = $\frac{1}{a} - \frac{1}{b} + ab$
What is the value of $\frac{1}{4}$ @ 12 ?

(A) $6\frac{11}{12}$ (B) $6\frac{7}{12}$ (C) $6\frac{5}{12}$ (D) $6\frac{1}{12}$ (E) $5\frac{11}{12}$

18. Write down the units digit of:-
$17^{201} + 111^{201} - 7^{201}$

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

19. Find the value of c if a + b - x = 100^0



(A) 120^0 (B) 110^0 (C) 100^0 (D) 90^0 (E) 80^0

20. 5 digits 2; 3; 5; 6 and 8 are used to make 3 digit numbers such that 3 cannot be the units digit; 5 cannot be the hundreds digit and 2 cannot be the tens digit. eg. 632; 666. What is the sum of all such numbers?

(A) 344260 (B) 342560 (C) 34256 (D) 3456 (E) 3454

MARKS: 1-15: 15 X 1 = 15

16-20: 5 X 2 = 10

TOTAL: 25

SOUTHERN AFRICAN JUNIOR MATHEMATICS OLYMPIAD

FEMSISA MATHEMATICS OLYMPIAD

(SAJMO)

GRADE NINE

ROUND ONE

DATE: 4-8 JUNE 2012

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Grade Nine Mathematics Olympiad 2012

1. Find the value of 4.8 ÷ 0,3 x 0.2

(A) 0.032 (B) 0.32 (C) 3.2 (D) 32 (E) 30.2

2. Tiny beat the 400 m record by 0,04 seconds. If the old record was 43,1 seconds then what is the new record in seconds?

(A) 43.06 (B) 43.14 (C) 43.006 (D) 42.06 (E) 43.6

3. If 20% of the property is 3600m^2 then what is 50% of this property?

(A) R3 000 (B) R6 000 (C) R9 000 (D) R12 000 (E) R18 000

4. If 13 April falls on Friday in 2012, then in which earliest year will 13 April fall on a Friday again?

(A) 2017 (B) 2018 (C) 2019 (D) 2020 (E) 2021

5. How many perfect squares natural numbers lie between 100 and 400 ?

(A) 13 (B) 12 (C) 11 (D)10 (E) 9

6. Write down the value of a + b if $8x^2 - 2x = a(4x - b)$

(A) 3x (B) 2x - 1 (C) x - 2 (D) 2x + 1 (E) 4x

7. If a = 3b and 2c = 5b then a - b + c is equal to…

(A) $\frac{2b+3}{2}$ (B) $\frac{3b-2}{2}$ (C) $\frac{5b}{2}$ (D) $\frac{7b}{2}$ (E) $\frac{9b}{2}$

8. What is the minimum number of pears that can be divided equally among 6; 8 or 20 learners?

(A) 120 (B) 124 (C) 34 (D) 60 (E) 2

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

x	2	3	4	5
y	10	13	16	19

(A) y = 4x-1 (B) y = 2x – 3 (C) y= 4x (D) y =3x+4 (E) y =3x-4

10. Mr Y had R2 and 50 cent coins. In how many ways can Mr Y give change for R10?

    (A) 4 (B) 5 (C) 6 (D) 7 (E) 8

11. In a straight row of 100 houses every 3^{rd} house received a solar heater starting from house number one. Every 5^{th} house received a geyser timer. How many houses received a solar heater or a geyser timer?

    (A) 53 (B) 52 (C) 44 (D) 45 (E) 47

12. Give the sum of the digits of the following product:-

    77 777 x 99 999

    (A) 36 (B) 45 (C) 54 D) 63 (E) 72

13. Give the units digit of:-

    $17^{206} + 111^{206} - 7^{206}$

    (A) 7 (B) 5 (C) 3 (D) 2 (E) 1

14. The sum of three whole numbers is 46. The greatest possible product the numbers can have is…

    (A) 3300 (B) 3600 (C) 3900 (D) 4200 (E) 4500

15. The sum of five consecutive numbers is p. The smallest number is…

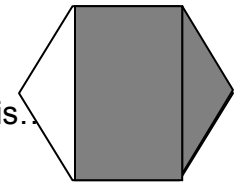
    (A) $\frac{p}{5}$ (B) $\frac{p-3}{5}$ (C) $\frac{p-10}{5}$ (D) $\frac{p+5}{5}$ (E) $\frac{p+10}{5}$

16. What is the value of :-

    22222 x 22223 – 22224 x 22221 ?

    (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

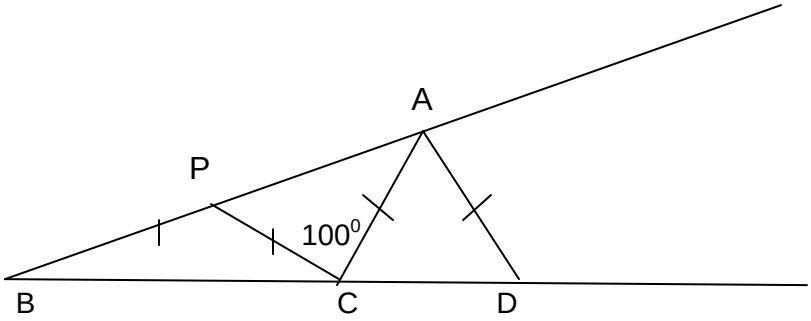
17. If the area of the shaded region of a regular hexagon



is 15cm^2 then determine the area of the non shaded hexagon in cm^2 is..

(A) 3 (B) 4.5 (C) 6 (D) 7 (E) 8

18.

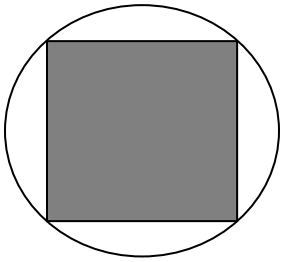


In the above figure BP = PC = CA = AD; $P\hat{C}A$ = 100^0. Calculate $D\hat{A}C$.

(A) 54^0 (B) 57^0 (C) 60^0 (D) 30^0 (E) 24^0

19. A circle is drawn to touch the 4 vertices of the square with side measuring 3m.

Calculate the area of the non shaded region.



(A) $\frac{9\pi+18}{2}$ (B) $\frac{9\pi-18}{2}$ (C) $\frac{4\pi-18}{2}$ (D) $\frac{4\pi+18}{2}$ (E) 9 - 2π

20. A mixture of concentrate and water is made in the ratio concentrate:water =k:m. Adding x units of water or removing x units of concentrate (x$\neq$ 0) each produces the same new ratio of concentrate:total. What is the numerical value of this new ratio?

(A) $1:6$ (B) 1:5 (C) $1:4$ (D) $1:2$ (E) $1:3$

MARKS: 1-15: 15 X 1 = 15

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SOUTHERN AFRICAN JUNIOR MATHEMATICS OLYMPIAD

FEMSISA MATHEMATICS OLYMPIAD

(SAJMO)

GRADE TEN

ROUND ONE

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Grade Ten Mathematics Olympiad 2012

1. What is the value of $(0.1)^3$

(A) 1 (B) 0.1 (C) 0.01 (D) 0.001 (E) 0.0001

2. How many zeros are there in 12 x 36 x 75 x 15 x 4

(A) 3 (B) 4 (C) 5 (D) 6 (E) 7

3. If 2a = 3b and 2c = 5b then a+ b – c is equal to…

(A) 0 (B) $\frac{b-2}{3}$ (C) $\frac{4b}{3}$ (D) $\frac{b}{3}$ (E) $\frac{5b}{3}$

4. What is the minimum number of apples that can be shared among 72 ; 54 or 90 people?

(A) 108 (B) 216 (C) 1080 (D) 1200 (E) 1800

5. The table below shows the relationship between x and y which is in the form y = $\frac{a}{x+p}$. The equation is …

x	-1	1	4
y	2	3	12

(A) y = $\frac{-6}{x-5}$ (B) y = $\frac{6}{x+1}$ (C) y = $\frac{24}{x-2}$ (D) y = **x+3** (E) y = $\frac{-12}{x-5}$

6. If $\frac{2}{x} + \frac{x}{2} = 2$ *then write down the value of* $\frac{4}{x^2} + \frac{x^2}{4}$

(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

7. Evaluate

2037 x 2035 – 2039 x 2033

(A) 1 (B) 2 (C) 4 (D) 6 (E) 8

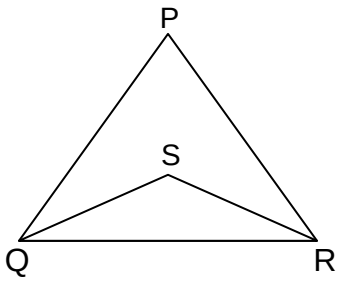
8. What is the units digit of 3^{101} x 2^{100} ?

(A) 2 (B) 3 (C) 4 (D) 8 (E) 1

9. If n is a perfect square then what is the perfect square before n?

(A) $\sqrt{n} - 1$ (B) $2\sqrt{n} - 1$ (C) $n - 2\sqrt{n} + 1$ (D) $n - 1$ (E) $(n-1)^2$

10. In $\Delta PQR; P\hat{Q}S = S\hat{Q}R \text{ and } P\hat{R}S = S\hat{R}Q$; *then write down* $\hat{S}$ *in terms of* $\hat{P}$.



(A) $\mathbf{90^0 - \frac{\hat{P}}{2}}$ (B) $90^0 + \hat{P}$ (C) $90^0 - \hat{P}$ (D) $180^0 - \hat{P}$ (E) $90^0 + \frac{\hat{P}}{2}$

11. If a number N has exactly 7 divisors after leaving a remainder of 16 then write down the smallest possible value of N if N > 16.

(A) 391 (B) 475 (C) 4912 (D) 7445 (E) 8091

12. Give the sum of the digits of the following product:-

666 667 x 999 999

(A) 54 (B) 63 (C) 72 (D) 81 (E) 90

13. If 4^{x-1} = t then write down in terms of t the value of 2^x

(A) $2\sqrt{t} - 1$ (B) $4t$ (C) $2t$ (D) $4\sqrt{t}$ (E) $2\sqrt{t}$

14. 4 litres of X soft is made up of 30% concentrate and 70% water. How many litres of water must be added for the mixture to ensure that there is 80% water?

(A) 0.1 (B) 1 (C) 2 (D) 3 (E) 4

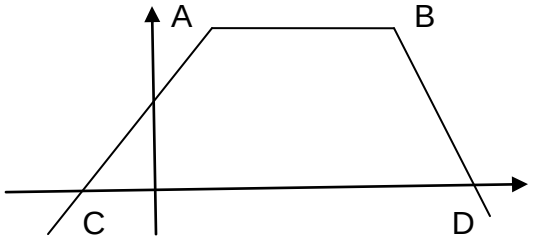
15. The sum of the squares of 2 consecutive numbers is p. What is the smaller of the two numbers in terms of p.

(A) $\frac{-1-\sqrt{2p-1}}{2}$ **(B)** $(\frac{-1+\sqrt{2p-1}}{2})^2$ **(C)** $\frac{p+3}{2}$ **(D)** $\frac{p-3}{p}$ **(E)** $\frac{\sqrt{2p+1}}{2}$

16. If a + b = 5 and a.b = 3 then what is the value of $a^3 + b^3$?

(A) 64 (B) 80 (C) 100 (D) 108 (E) 144

17. C and D are the x-intercepts and AB ‖ CD. The equation of AB is y = 6 and BD is y = - x + 14 and the area of ABCD is 72 sq units. Determine the equation of AC in the form y = x + c.

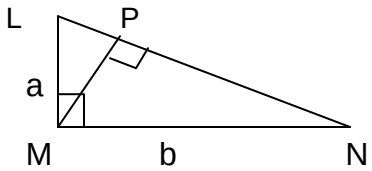


(A) y = x + 4 (B) y = x + 6 (C) y = x + 12 (D) y = x + 14 (E) y = x + 16

18.A circle and square have the same perimeter. Calculate the ratio of the area of the circle to the area of the square.

(A) $4:3\pi$ (B) $2:3\pi$ (C) $4:\pi$ (D) $2:\pi$ (E) $\pi:2$

19.



In the above $\Delta LMN; \hat{M} = 90^0; M\hat{P}N = 90^0; LP = 2; PN = 4; LM = a; MN = b$

The value of a+b is…

(A) $2\sqrt{3}$ (B) $2\sqrt{3}$+1 (C) $3\sqrt{2}$ (D) $2\sqrt{3}(\sqrt{2} + 1)$ (E) $2\sqrt{3}$ - 1

20. There are 720 arrangements of the word M U E S L I. If these arrangements are written in alphabetical order then what is the 4th letter of the 200th word in the list?

(A) M (B) L (C) I (D) S (E) U

MARKS: 1-15: 15 X 1 = 15

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