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| **JETS PREPARATORY MEETING.** |
| MATHEMATICS CATEGORY. |
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| TO PREPARE QUESTIONS THAT ARE TO BE USED DURING JETS FAIR. |
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| **MATHS PANEL** |
| **2/16/2012** |
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**SENIOR OLYMPIADS QUESTIONS**

**1. (a**) of the girls in grade 12 plays Netball and play Volleyball. Each girl plays at least one

of these games. If 27 girls play both games, How many girls;

(i) Are there in grade 12 **4marks**

(ii) Play Netball **2marks**

(iii) Play Volleyball only **2marks**

(iv) Find the probability of these who only play Netball **3marks**

**(b**) A meeting was set for five people, Mr and Mrs. Adams, Mr Bwalya, Mr. Chanda and

Mr. Daka in which they are to sit on a circular table.

(i) In how many ways can they sit if Mr. and Mrs. Adams are to sit together? **2marks**

(ii) In how many ways can they sit if Mr. and Mrs. Adams are not to sit together? **2marks**

**2. (a)** Evaluate dx **10marks**

**(b)** Differentiate = with respect to . **5marks**

**3. (a)** Solve the equation - 4 + 3 = 0 **5marks**

**(b)** Solve = y = simultaneously. **5marks**

**(c)** Express in partial fractions. **5marks**

**4. (a)** Let A = find the values of x for which the determinant of A is 36.

**5marks**

**(b)** Solve the system of equations below by using the crammers’ rule..

x + y + z = 0

2x – y + 3z = 11

3x – 2y – 5z = -1 **5marks**

**(c)** The expression 2 + h + kx + 2 has a factor ( x + 2) and the remainder is 18 when it is

divided by ( x – 1 ). Find the values of h and k.  **5marks**

**5.** (i) Given that = 2i – j + λk and = -i + 3j – k are vectors where λ is a real number, find;

(a) **2marks**

(b) **2marks**

(c) λ if the angle between and is **5marks**

(ii) In the diagram below, the position vectors of p and q relative to an origin **O** are 2λ and µ

respectively.

P

2λ R

S

O µ Q

(a) Given that =K, express in terms of k, λ and µ. **2marks**

1. The point S lies on PQ such that PS:SQ = 3:2. Given also that =h, express in terms of h and µ. **2marks**
2. Hence, find the value of h and of k. **2marks**

**6.** (a) Express as a single fraction - **2marks**

**(b)** Rationalize the denominator **2marks**

**(c)** Given that = 2 + 3i and = 3 – 2i, find

(i) **2marks**

(ii) **2marks**

1. The equation of a circle is given by + + 4x – 6y + 9 = 0.By completing the squares, state the centre of this circle. **4marks**
2. One root of the equation + px + q = 0 is 2 - 3i, find the values of p and q. **3marks**

**7. (a)** Prove that - = **4marks**

**(b)** Given that ax2 + bx + c = 0 is a standard form of a quadratic equation. Derive the

quadratic formula using the completing the square method. **5marks**

**(c)** Solve the equation 2= 2 for 00 .  **6marks**

**8.(a)** The function f is defined by f:x for the domain 3

(i) By first considering the stationary value of the function x show that the

graph of y = f(x) has a stationary point at x = 4 and determine the nature of this stationary

point. **4marks**

(ii) Sketch the graph of y = f(x) for 3 **2marks**

(iii) find the range of f(x). **2marks**

**(b) (**i) The roots of the equation 2 are , find the equation whose roots

are and **5marks**

(ii) For what values of k is 9 a perfect square. **2marks**

**9.** **(a)** You are given the coordinates of four points A(6,2), B(2,4), C(-6,-2) and D(-2,-4)

(i) Show that the equation of the line DA is 4y – 3x = -10, and find the length DA. **2marks**

(ii) Find the equation of the line L through B which is perpendicular to DA. **3marks**

(iii) Calculate the coordinates of the point p where L meets DA **3marks**

(iv) Calculate the area of the figure ABCD **2marks**

**(b)** Given that a + bx + cx2 + + …, find the values of the constants

a, b, c and d. **5marks**

**10.(a)** A set, **P**, consists of 12 measurements and a set, Q, consists of 18 measurements. The

two sets are combined to form a new set, **R**, consisting of all 30 measurements. The table

below shows the mean and the standard deviation of the measurements in each set.

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| Set | Number of measurements | Mean |
| **P** | 12 | x |
| **Q** | 18 | 20 |
| **R** | 30 | 18 |

Find the value of x. **3marks**

**(b)** Find the equation of the circle whose centre is at the point (2,1) and which passes

through the point(4,-3). **3marks**

**(c)** When is expanded as a series in ascending powers of , the first three terms

are given by 1 – 8+ 302. Calculate the values of and .  **5marks**

**(d)** Find the equation of the line which is parallel to the line 3x + 4y = 12 and which has an

intercept of 5 units on the x-axis. **4marks**

11. (a) Differentiate from first principle

**6marks**

(b) Solve the inequality;

**3marks**

(c) Find the values of x for which the function 2 - 8 is decreasing.  **3marks**

(d) An arithmetic progression with 19 terms has first term and common difference .

Show that the sum of the last five terms is . **3marks**

12. (i) Evaluate dx **7marks**

(ii) Sketch the graph of **3marks**

(iv) Find the coordinates of the point where the curves and

meet and the gradient of each curve at that point. **5marks**