Mathematics VI
113
07 Nov 2006   8.30 am – 11.30 am
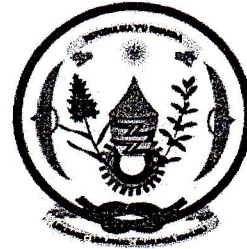
ORDINARY LEVEL NATIONAL EXAMINATION 2006

SUJECTS : MATHEMATICS VI

**LEVEL** : TRONC COMMUN

DURATION : 3 HOURS

INSTRUCTIONS:

- This paper consists of **TWO** Sections **A** and **B**.

- Attempt **ALL** questions in Section **A** and any **THREE** questions in Section **B**.

- Show **ALL** working clearly.

- Calculators and mathematical instruments may be used.

SECTION A/55 MARKS

1. Simplify completely: $(0.4 \times 1\frac{2}{3}) - \frac{1}{6}$

(3 marks)

2. Solve for x: $3(x + 2) - 2(3x - 4) = x + 18$.

(3 marks)

3. The simple interest on 200,000 Rwf for 5 years is 50,000Rwf, calculate the percentage interest rate per year.

(3 marks)

4. Evaluate without using a calculator: $\dfrac{\sqrt{75} + \sqrt{27}}{\sqrt{12}}$

(4 marks)

5. Solve: $2x - 4 < 3x + 7$. Illustrate the solution on a graph.
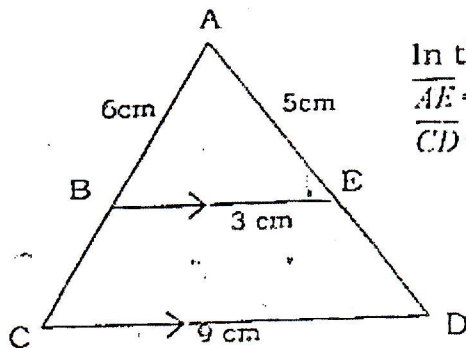
(3 marks)

6.
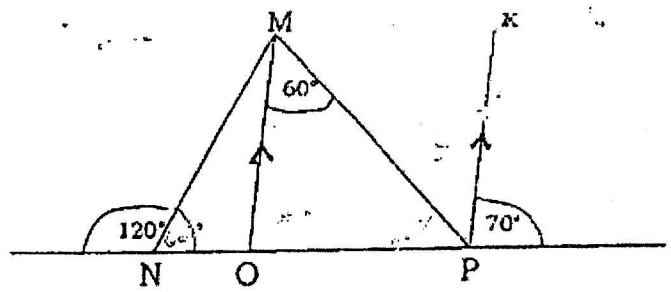
From the diagram, determine the size of:

  (a) angle MOP   **(½ mark)**

  (b) angle MPO   **(1½ marks)**

  (c) angle NMO   **(3 marks)**

7. Given that $x = -2$ and $y = 4$, find the value of $xy^2 - 2(x - y)$

(3 marks)

8. Plot the vectors to show that points R(0, 2), S(2, 4), and T(5, 7) are collinear. (that the three points lie on the same line).

(4 marks)

9. M is inversely proportional to n. When m = 3, n = 4. Find n when m = 2.

(3 marks)

10. Given that functions $f(x) = x^2 - 1$ and $g(x) = 3x - 1$, find x when $fg(x) = 0$.

(4 marks)

11. In the figure below, $\overline{BE}$ is parallel to $\overline{CD}$. AE = 5cm, AB = 6cm, $\overline{BE}$ = 3cm and

$\overline{CD}$ = 9cm. Calculate: (a) length BC **(2 marks**
(b) length AD **(2 marks**

A

6cm 5cm

In t'
$\overline{AE}$ =
$\overline{CD}$:

B   E
3 cm

C 9 cm   D

12. Solve the following simultaneous equations:
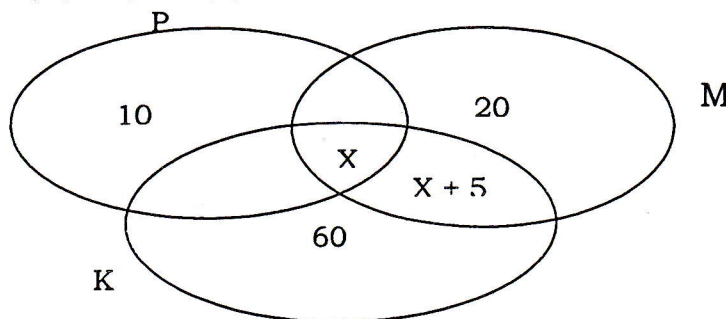$x + y = 1$
$3x - 2y = 8.$ **(4 marks**

13. In the figure below ABC is a right angled triangle and $\overline{BD}$ is perpendicular to $\overline{AC}$.
Calculate $\overline{BD}$. **(4 marks**

A

D

12 cm

B   9cm   C
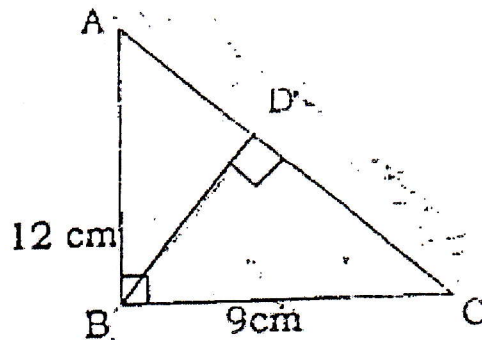
14. The Venn diagram below shows the number of senior three pupils in a school who like mathematics (M), Physics (P) and Kinyarwanda (K) 55 pupils like mathematics.

P

10   20   M

X
X + 5
60

K

a) How many pupils like the three subjects? **(2 marks**
b) Find the total number of senior three pupils in the school. **(1 mark**
c) Pupils who like Physics and Kinyarwanda only? **(1 mark**

15. If $x^2 + ax + 6 = 0$ is -2.Find a and other solution. **(4 marks**

SECTION B (45 marks)

16. (a) Simplify completely: $\dfrac{6x^2 + 13x + 6}{4x + 6}$ **(5 marks)**

    (b) Solve: $2x^3 + 9x^2 - 2x - 24 = 0$.   **(10 marks)**

17. The weights of babies born during December 2005 at a hospital are shown in the table below.

Weight of babies	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.0
Frequency	4	2	1	5	6	8	4	9

   a) i) Find the total number of babies born in December 2005.   **(1 mark)**

     ii) Find the number of babies weighing more than 2.5 kg.   **(1 mark)**

    iii) Find the range of the masses.   **(1 mark)**

    iv) The mode mass.   **(1 mark)**

    v) The median mass.   **(2 marks)**

    vi) The mean mass. Correct the answer to one decimal place.   **(5 marks)**

   b) If the ratio of baby girls to baby boys is 5:8, find the number of:

    i) baby girls born in December 2005.   **(2 marks)**

    ii) baby boys born in December 2005.   **(2 marks)**

18. (a) In a restaurant 3 cups of tea and 2 cups of coffee altogether cost 2900 Rwf. In a hotel 4 cups of tea and 3 cups of coffee cost 4100Rwf.
    Find the cost of :   i) a cup of tea
                     ii) a cup of coffee.   **(9 marks)**

   (b) A car can be bought on cash or on hire purchase terms. The price of the car is

    5,000,000 Rwf. By hire purchase, it can be bought by paying a 30% deposit of cash

    and the balance paid back in 7 months installment of 600, 000 Rwf.

    (i) Find the price of the car on hire purchase terms.   **(4½ marks)**

    (ii) Calculate the extra money paid for the car by hire-purchase than cash.   **(1½ marks)**

19. The figure below is a circle with center O. Angle UTW = 70°, angle TWO = 40°, angle VUO = 35°, angle UOW= y, angle TUO = z and angle UVW = x°.
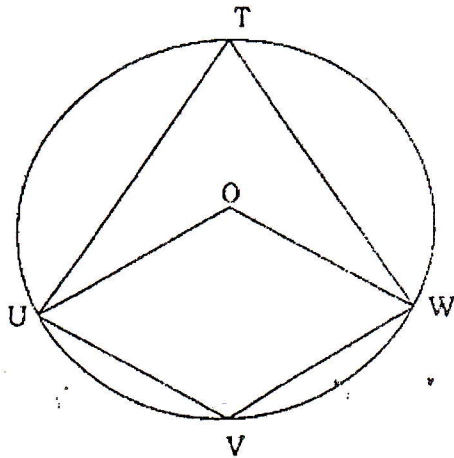
(a) Calculate the size of angle   i) x   **(1 mark)**

                                         ii) y   **(1 mark)**

                                         iii) z   **(3 marks)**

                                         iv) UWT   **(3 marks)**

(b) The length of minor arc UVW is 10.99cm. Calculate the area of the circle.

     $\pi = 3.14$. Correct the answer to one decimal place.   **(7 marks)**

20. Points A (5, 4), B (2, 2) and C (6, 2) are vertices of triangle ABC.

    (a) Use the graph paper in your answer booklet and draw triangle ABC on a Cartesian plane.   **(3 marks)**

    (b) Triangle ABC is rotated anti-clockwise about the origin. If the angle of rotation is +90°, find:

       (i) the coordinates of A', B' and C' the images of points A, B and C.   **(3 marks)**

       (ii) Draw triangle A'B'C' on the same graph as in 20(a).   **(2 marks)**

    (c) The image of A (5, 4) under a translation is (3, 3). Find coordinates of images of

    (d) The image of C (6, 2) under a reflection is (2, 2). Find the equation of the line of reflection and image of A and B.   **(3 marks)**

END

ANSWERS FOR NATIONAL EXAMINATION 2006.
MATHEMATICS VI
SECTION A

1. $(0.4 \times 1\frac{2}{3}) - \frac{1}{6}$ $= (\frac{4}{10} \times \frac{5}{3}) - \frac{1}{6} = \frac{4}{6} - \frac{1}{6} = \frac{3}{6}$ $= \frac{1}{2}$	**2.** $3(x + 2) - 2(3x - 4) = x + 18$ $= 3x + 6 - 6x + 8 = x + 18$ $= 3x - 6x - x = 18 - 6 - 8$ $= -4x = 4$ $= x = -1$	**3.** The annual rate is $= \frac{50,000 \times 100}{200,000 \times 5} = 5$ The rate is 5%
4. $\frac{\sqrt{75} + \sqrt{27}}{\sqrt{12}} \times \frac{12}{12}$ $= \frac{\sqrt{900} + \sqrt{324}}{\sqrt{144}} = \frac{30 + 18}{12} = \frac{48}{12}$ $= 4$	**5.** $2x - 4 < 3x + 7$ $= 2x - 3x < 7 + 4$ $= -x < 11$ $= x > -11$ (illustration: teacher's guidance)	**6.** a) MOP = 70° b) MPO = 180 − (60° + 70°) $\quad$ = 50° c) NMO = 180° − (110° + 60°) $\quad$ = 10°
7. $xy^2 - 2(x - y)$ $= (-2)4^2 - 2(-2 - 4)$ $= -32 + 12 = -20$	**8.** $\overline{RS} \begin{bmatrix} 2 - 0 \\ 4 - 2 \end{bmatrix} = 2\begin{bmatrix} 2 \\ 2 \end{bmatrix} = 2\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $\overline{ST} \begin{bmatrix} 5 - 2 \\ 7 - 4 \end{bmatrix} = \begin{bmatrix} 3 \\ 3 \end{bmatrix} = 3\begin{bmatrix} 1 \\ 1 \end{bmatrix}$	**9.** M is inversely proportional to N $\Rightarrow m = \frac{k}{n} = 3 = \frac{k}{4} = k = 12$ Hence $m = \frac{12}{n} = 2 = \frac{12}{n}$ n = 6
10. $f[y(x)] = (3x - 1)^2 - 1$ $9x^2 - 6x + 1 - 1 = 9x^2 - 6x$ $= 9x^2 - 6x = 0$ $= 3x(3x - 2) = 0$ $= x = 0$ or $x = \frac{2}{3}$	**11.** a) $= \frac{AB}{AC} = \frac{BE}{CD} \Leftrightarrow \frac{AB}{AB+BC} = \frac{BE}{CD}$ If BC = x cm, $\frac{6}{6+x} = \frac{3}{9}$, $54 = 18 + 3x$ $3x = 36$ $x = 12.$	**11** b) $\frac{AE}{AD} = \frac{BE}{CD} \Leftrightarrow \frac{AE}{AB+DE} = \frac{BE}{CD}$ If ED = y cm, Then, $\frac{5}{5+y} = \frac{3}{9}$ $15 + 3y = 45$ $3y = 30$ Y = 10 AD = 10 + 5 = 15cm.

16.

a) $\dfrac{6x^2 + 13x + 6}{4x + 6} = \dfrac{6x^2 + 9x + 4x + 6}{4x + 6}$

$= \dfrac{3x(2x+3) + 2(2x+3)}{2(2x+3)}$

$= \dfrac{(2x+3)(3x+2)}{2(2x+3)} = \dfrac{3x+2}{2}$

17.

i	Xi	Ri	Ric	RiXi
1	2.2	4	4	8.8
2	2.3	2	6	4.6
3	2.4	1	7	2.4
4	2.5	5	12	12.5
5	2.6	6	18	15.6
6	2.7	8	26	21.6
7	2.8	4	30	11.2
8	3	9	39	27
		39		104

a) i) $4 + 2 + 1 + 5 + 6 + 8 + 4 + 9 = 39$.

ii) $6 + 4 + 8 + 9 = 27$

iii) 0.8kg

iv) mode = 2.0 kg

v) median = 2.7 kg

vi) mean mass = 2.6 kg

b) i) 15 baby girls.

ii) 24 baby boys.

b) $2x^3 + 9x^2 - 2x - 24 = 0$.

$x = -2$

$x + 2 = 0$

$x + 2$ is a factor of $2x^3 + 9x^2 - 2x - 24$

$$\begin{array}{r} 2x^2 + 5x - 12 \\ x + 2 \overline{\smash{\big)}\ 2x^3 + 9x^2 - 2x - 24} \\ \underline{-\ 2x^3 + 4x^2} \\ 5x^2 - 2x \\ \underline{-\ 5x^2 + 10x} \\ -12x - 24 \\ \underline{-\ -12x - 24} \\ 0 \end{array}$$

$2x^3 + 9x^2 - 2x - 24 = (x + 2)(2x^2 + 5x - 12)$

$= (x + 2)(2x^2 + 8x - 3x - 12)$

$= (x + 2)\ 2x(x + 4) - 3(x + 4)$

$= (x + 2)(2x - 3)(x + 4)$

$= (x + 2)(2x - 3)(x + 4) = 0$

$= x = -2$ or $x = \dfrac{3}{2}$ or $x = -4$

18. a) let one cup of tea be x

let one cup of coffee be y

$3x + 2y = 2900.....$(i)

$4x + 3y = 4900....$(ii)

(solve simultaneously)

$4 \mid 3x + 2y = 2900$

$3 \quad 4x + 3y = 4900$

$\overline{}$

$12x + 8y = 11{,}600$

$-12x + 9y = 12{,}300$

$\overline{}$

$-y = -700$

$\therefore y = 7$

Using equation ...(i):

$3x + 2y = 2900$

$3x + 2(700) = 2900$

$3x + 1400 = 2900$

$3x = 1500$

$x = 500$

$\therefore$ A cup of tea costs 500Rwf and a cup of coffee costs 700Rwf

18. b) i) Price of the car in hire purchase:

Deposit $= \dfrac{30}{100} \times 5{,}000{,}000 = 1{,}500{,}000$

Balance : $5{,}000{,}000 - 1{,}500{,}000$

$= 3{,}500{,}000$

600,000 in 7 months installment

$= 600{,}000 \times 7 = 4{,}200{,}000$
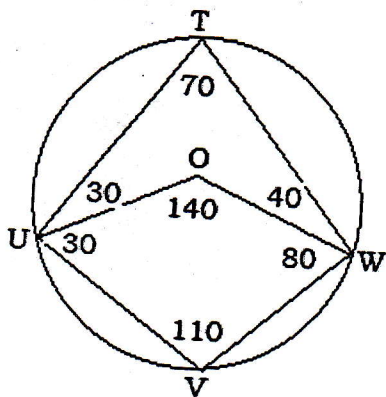
Price of the car on hire purchase terms

$= 1{,}500{,}000 + 4{,}200{,}000$

$= 5{,}700{,}000$Rwf

ii) Extra money paid for the car by hire purchase than cash

$= 5{,}700{,}000 - 500{,}000 = 700{,}000$Rwf.

19. a)

a)

i) $x = 180° - 70° = 110°$

ii) $y = 2x$

        $y = 2 \times 70 = 140°$

iii) $z = z + 30 + 40 + 80 = 180$

        $z + 150 = 180$

        $z = 180 - 150$

        $z = 30°$

iv)   UWT = 115°

b) Length of arc UVW = 10.99cm.

First find the radius of the circle

$$S = \frac{\theta}{360} \times 2\pi r$$

$$10.99 = \frac{140}{360} \times 2 \times \frac{22}{7} \times r$$

$$10.99 = \frac{22r}{9}$$

$$22r = 98.91$$

$$r = 4.5 \text{cm}$$

$$A = \pi r^2 = \frac{22}{7} \times 4.5 \times 4.5 = 63.5 \text{cm}^2$$

20. Teacher's guidance