



Mathematics V

012

5th Nov 2008

8.30am – 11.30 am

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ORDINARY LEVEL NATIONAL EXAMINATION 2008

SUBJECTS : MATHEMATICS V

TIME : 3 HOURS

INSTRUCTIONS:

- This paper consists of **TWO** Sections **A** and **B**.
- Attempt **ALL** questions in Section **A** (55 marks)
and any **THREE** questions in Section **B**. (45 marks)
- Show **ALL** working clearly.
- Calculators and mathematical instruments may be used except when otherwise stated.
- Diagrams are not drawn to scale.

SECTION A: Answer ALL questions (55 marks)

1. Simplify completely: $(2\frac{2}{5} - \frac{3}{7}) \div 1\frac{2}{7}$. (3 marks)
2. Find the equation of the line parallel to $y = 4x + 1$ which passes through point $(-3, -5)$. (3 marks)
3. Simplify: $\frac{\sqrt{162} + \sqrt{18}}{\sqrt{32}}$. (3 marks)
4. Simplify: $\frac{2x^3 - 3x^2 - 2x}{2x^2 + x}$, $x \neq 0$ (4 marks)
5. Given that $104n = 29_{ten}$, find n . (4 marks)
6. The base of a parallelogram is $(3x - 2)$ cm and the height is $(x + 1)$. Find the height of the parallelogram if its area is 12 cm^2 . (5 marks)
7. Solve the following inequality: $\{2x - (4x - 1) < 4 + x\} \cap \{5x + 1 < x + 9\}$. Illustrate the equation on a graph. (5 marks)
8. There are enough cow feeds to feed 360 cows for 21 days. Find how many more cows would be needed for the same feeds to last 12 days? (4 marks)
9. Solve simultaneously: $y = 6 - 3x$
 $3y + 4x = 8$ (5 marks)
10. Solve: $(x + 1)(x + 2) = (x - 3)^2 + 5$. (4 marks)
11. A chord 60 cm long is in a circle with a diameter 80 cm. How far is the chord from the centre of the circle? (2 marks)
12. An arc subtends an angle of 72° at the centre of the circle whose radius is 10cm. Calculate the area of the minor sector of the circle. $\pi = 3.14$. (2 marks)

SECTION B: Answer ant THREE questions in this section. (45 marks)

13. (a) 10 mathematics books and 5 physics books cost 220,000 Rwf, 6 mathematics books and 8 physics books cost 232,000 Rwf. Find the cost of one physics book. (8 marks)
- (b) Solve: $6x^3 + 5x^2 - 22x - 24 = 0$. (7 marks)

14. (a) Using a ruler, a pair of compasses and a protractor only, construct a triangle ABC in which line AB = 7cm, line BC = 5cm and line AC = 8cm. **(6 marks)**
- (b) Measure angles A, B and C. Write the measurements you have got? **(3 marks)**
- (c) Draw a perpendicular line from A to side BC. How long is the perpendicular line? **(4 marks)**
- (d) Calculate the area of triangle ABC. **(2 marks)**

15. If A (2, 3), B (-3, 1) and C (4, -2) are vertices of triangle ABC.

- (a) Plot points A, B and C on the Cartesian plane. Join the points to form triangle ABC. **(5 marks)**
- (b) Determine the coordinates of A', B' and C', the images of A, B and C respectively after a reflection in line $x = 0$. Draw triangle A'B'C' on the same Cartesian plane as in 17 (a). **(5 marks)**
- (c) What are the coordinates of A'' B'' and C'', the images of A, B and C, under the translation described by $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$? Draw triangle A'' B'' C'' on the same Cartesian plane as in 17(a). **(5 marks)**

16. The masses of 50 boys are given in the table below.

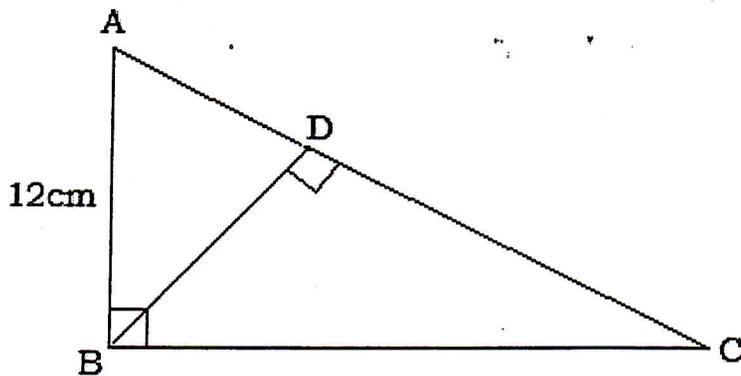
Mass (kg)	40-44	45-49	50-54	55-59
Frequency (f)	15	18	13	4

- a) Find the modal class and its limits. **(2 marks)**
- b) Determine the working mean. **(1 mark)**
- c) Copy and complete the table below using the data in the above table. **(8 marks)**

Class	Mid-interval of class x	Difference from the working mean d	Frequency	fd
40 - 49				
45 - 49				
50 - 54				
55 - 59				

- d) Find $\sum fd$. **(2 marks)**
- e) Calculate the mean mass. **(2 marks)**

17. In the figure below, triangle ABC and triangle BDC are right angled triangles.



- a) Show that triangle ABC is similar to triangle BDC. (5 marks)
- b) If the area of triangle ABC is 54cm^2 , find i) the length DC. (6 marks)
- ii) the length BD. (2 marks)
- iii) the area of triangle ABD. (2 marks)

END

ANSWERS FOR NATIONAL EXAMINATION 2008.

MATHEMATICS VI

SECTION A

<p>1. $(2\frac{2}{5} - \frac{3}{7}) \div 1\frac{2}{7} = (\frac{12}{5} - \frac{3}{7}) \div \frac{9}{7}$</p> $= \frac{84-15}{35} \div \frac{9}{7} = \frac{69}{35} \times \frac{7}{9} = \frac{69}{45}$	<p>2. Equation of the line:</p> $(y + 5) = 4(x+3)$ $y + 5 = 4x + 3$ $y = 4x - 3 - 5$ $y = 4x - 2$	<p>3. $\frac{\sqrt{162} + \sqrt{18}}{\sqrt{32}} \times \frac{\sqrt{32}}{\sqrt{32}}$</p> $= \frac{\sqrt{5184} + \sqrt{576}}{32} = \frac{96}{32} = 3.$
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$$4. \frac{2x^3 - 3x^2 - 2x}{2x^2 + x} = \frac{x(2x^2 - 3x - 2)}{x(2x - 1)}$$

$$= \frac{x(2x - 1)(x - 1)}{2x - 1} = x - 2$$

7.

$$\{2x - (4x - 1) < 4 + x\} \cap \{5x + 1 < x + 9\}$$

$$2x - 4 + 1 < 4 - x$$

$$-3x < 3$$

$$x < -1$$

$$5x + 1 < x + 9$$

$$4x < 8$$

$$x < 2$$

thus $(x < -1) \cap (x < 2)$

5. $104n = 29ten$

$$= (1 \times n^2) + (0 \times n^1) + (4 \times n^0)$$

$$= n^2 + 4 = 29$$

$$= n^2 - 25 = 0$$

$$= (n + 5)(n - 5) = 0$$

$$= n = -5 \text{ or } n = 5$$

Therefore $n = 5$

6.

Area of a parallelogram

$$= \text{Base} \times \text{height}$$

$$= (3x - 2)(x + 1) = 3x(x + 1) - 2(x + 1)$$

$$= 3x^2 + x - 2$$

$$= 3x^2 + x - 2 = 12$$

$$= 3x^2 + x - 14 = 0$$

$$= 3x(x - 2) + 7(x - 2) = 0$$

$$= 3x + 7 = 0 \text{ or } x - 2 = 0$$

$$= 3x = -7 \text{ or } x = 2$$

\therefore Height of $= 2 + 1 = 3\text{cm}$.

8.

21 days = 360 cows

1 day = $(360 \div 21)$ cows

12 days = $\frac{360 \times 21}{12} = 630$ cows

More cows needed = $630 - 360$

= 270 cows.

9. $y = 6 - 3x$

$$3y + 4x = 8$$

$$3(6 - 3x) + 4x = 8$$

$$18 - 9x + 4x = 8$$

$$18 - 5x = 8,$$

$$x = 2$$

$$y = 6 - 3x$$

$$y = 6 - (3 \times 2)$$

$$y = 6 - 6$$

$$y = 0$$

10.

$$(x + 1)(x + 2) = (x - 3)^2 + 5$$

$$x(x + 2) + (x + 2) = (x - 3)(x - 3) + 5$$

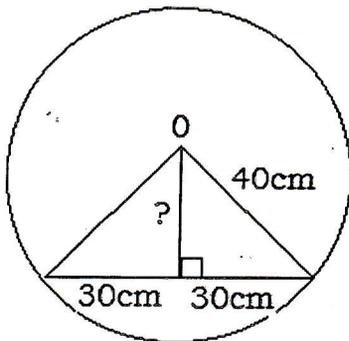
$$x^2 + 2x + x + 2 = x^2 - 3x - 3x + 9 + 5$$

$$x^2 + 3x + 2 = -6x + 14$$

$$9x = 12$$

$$x = \frac{4}{3}$$

11.



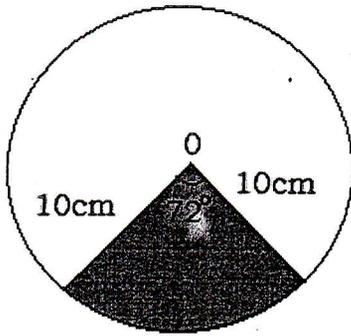
Let the required length be h

$$h = 40^2 - 30^2$$

$$h = \sqrt{40^2 - 30^2}$$

$$h = \sqrt{700}$$

12.



$$\text{Area} = \frac{72}{360} \times 3.14 \times 10 \times 10$$

$$= \frac{314}{5} = 62.8\text{cm}^2$$

SECTION B

13. a) Let m be the cost of maths books

Let p be the cost of Physics books

$$6 | 10m + 5p = 220,000$$

$$10 | 6m + 8p = 232,000$$

$$60m + 30p = 1,320,000$$

$$60m + 80p = 2,320,000$$

$$= -50p = 1,000,000$$

$$P = 20,000$$

Hence the cost of one physics book is 20,000Frw.

b) $6x^3 + 5x^2 - 22x - 24 = 0$

	6	5	-22	-24
2		12	34	24
	6	17	12	0

$$6x^2 + 5x^2 - 22 - 24 = (x - 2)(6x^2 + 17x + 12)$$

$$= (x - 2)(6x^2 + 9x + 8x + 12)$$

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

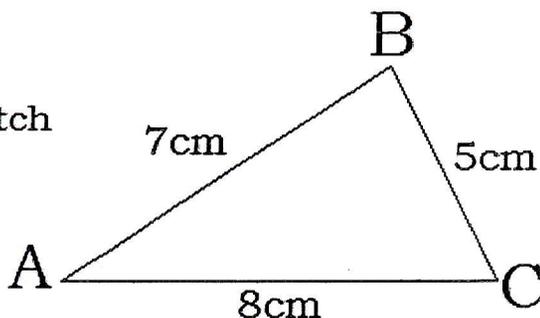
$$(x - 2)(3x + 4)(2x + 3) = 0$$

$$x = 2, \quad 3x = -4, \quad 2x = -3$$

$$x = \frac{-4}{3} \quad x = \frac{-3}{2}$$

14. a)

sketch



b) Angle A = 40°, B = 80°, C = 60°

(result angle range = 38° - 40° and 80° - 82°)

c) perpendicular line = 6.9 cm

d) Area of ABC = $\frac{1}{2} \times 6.9 \times 5$

$$= \frac{34.5}{2} = 17.25\text{cm}^2$$

15. Teacher's guidance

16.

a) Modal class = 45 - 49

Its limits = 44.5 - 49.5 or 45 - 49

b) the mean = 47

c)

Class	Mid-interval of class x	Difference from the working mean d	Frequency	fd
40 - 49	42	-5	15	-75
45 - 49	47	0	18	0
50 - 54	52	5	13	65
55 - 59	57	10	4	40

a) $\sum fd = -75 + 0 + 65 + 40 = 30$

b) Mean mass = $47 + \frac{30}{50} = 47.5\text{kg}$

17. a)

$\bar{A}BC = \bar{B}DC$

$\bar{A}CB = \bar{B}CD$ (common angle)

Triangle ABC and BDC share a common angle C, hence $\bar{A}CB = \bar{B}CD$, So $\bar{B}AC = \bar{C}BD$

b) i) $\frac{1}{2} \times 12 \times \bar{BC} = 54\text{cm}^2$

$BC = \frac{54 \times 2}{12} = 9$

$AC = \sqrt{12^2 + 9^2} = \sqrt{144 + 81} = \sqrt{225} = 15\text{cm}$

$\frac{DC}{BC} = \frac{BC}{AC} = \frac{\bar{DC}}{9} = \frac{9}{15}$

$DC = \frac{81}{15} = 5.4\text{cm}$

ii) $\frac{BD}{12} = \frac{9}{15}$

$BD = \frac{9 \times 12}{15} = 7.2\text{cm}$

iii) Area of triangle ABD

$= \frac{1}{2} \times 7.2 \times (15 - 5.4)$

$= \frac{7.2 \times 9.6}{15} = 34.56\text{cm}^2$