



GRADE 10

# MATHEMATICS

November exam

Paper 1

TIME: 3 Hours

DATE: 17 November 2014

MARKS: 150

EXAMINER: Miss Pearce

### Instructions

1. Illegible work, in the opinion of the marker, will earn zero marks.
2. Number your questions clearly and accurately
3. Staple your submission in the following order
  - Folioscap answers in correct order
  - Question paper at the back.
4. Employ the relevant formulae and show all working out. Answers alone may not be awarded full marks.
5. Non programmable and non- graphical calculators may be used, unless their usage is specifically prohibited.
6. Round off to 2 decimal places where necessary, unless instructed otherwise.
7. Start each question at the top of a new page
8. Leave two lines open between each of your answers.

### Question 1 ( 8 Marks)

- 1.1) Write  $2,45$  as an improper fraction, show all your working out. 4
- 1.2) Is  $\frac{22}{7}$  rational or irrational? 1
- 1.3) Given:  $\frac{\sqrt{7-x}}{x+2}$

For which values of  $x$  is the given expression:

- 1.3.1) undefined 1
- 1.3.2) non- real 2

### Question 2 (9 Marks)

- 2.1) Multiply out and then simplify the following fully.
- 2.1.1)  $6(x + 2)y - 4x$  1
- 2.1.2)  $(x - y)^2 - (x + y)^2$  3
- 2.1.3)  $(\frac{2a}{3} + 4)(\frac{4a^2}{9} - \frac{8a}{3} + 16)$  2
- 2.2) If  $x + \frac{1}{x} = a$
- Express  $x^2 + 3 + \frac{1}{x^2}$  in terms of  $a$  3

### Question 3(23 Marks)

Factorise the following fully.

- 3.1.1)  $3(a - 1)a^2 - 4a(1 - a) + a - 1$  3
- 3.1.2)  $-12x^2 - 10x + 8$  3
- 3.1.3)  $2x^{\frac{3}{8}} - 7x^{\frac{3}{16}} - 4$  3
- 3.1.4)  $4x^2(3y + 1) - 9y^2(2x + 1)$  4

3.2) Simplify the following fully

3.2.1)  $\frac{4}{3-x} - \frac{x+1}{x^3-27}$

3.2.2)  $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{y^2} - \frac{1}{x^2}}$

Question 4 (26 Marks)

4.1) Solve for x in each of the following.

4.1.1)  $x - x^2 = 0$

4.1.2)  $9x^2 + 3x = 2$

4.1.3)  $3^{2x-1} = 5$

4.1.4)  $(x^{\frac{7}{3}} + 5)(x^{\frac{2}{3}} + 2) = 0$

4.1.5)  $x - \frac{x-2}{3} = 1\frac{1}{2} + \frac{7x}{8}$

4.1.6)  $\frac{ax-b}{ax+b} = \frac{2}{a}$

4.1.7)  $3(2x - 1) = 2(3x + 1)$

4.2) Solve for x and y simultaneously

$x + 2y = 4$

$3x + y = 7$

4.3) Given:  $3 < -2x - 5 \leq 7$

4.3.1) Solve for x

4.3.2) Represent your answer to 4.3.1 on a number line

4.3.3) Represent your answer to 4.3.1 in interval notation

Question 5 (12 Marks)

5.1) Simplify the following

5.1.1)  $\frac{36^{n+2} \times 8}{2^n \times 24^{2n-1}}$

5.1.2)  $\frac{3^x - 3^{x-1}}{3^x}$

5.2) Simplify without the use of a calculator

$4x^{\frac{1}{2}}(x^{\frac{-1}{2}} - 2x^{\frac{-5}{2}})$

5.3) If  $3^x = k$ , determine the following in terms of k

5.3.1)  $27^x$

5.3.2)  $3^{x+2}$

5.3.3)  $4 \cdot 3^{-x}$

Question 6 (6 Marks)

6.1) Given: 6; 11; 16...

6.1.1) write down an expression for the  $n^{\text{th}}$  term of the sequence  $T_n$ .

6.1.2) Hence determine if 216 is a number in this sequence

6.2)  $4x - 3$ ;  $6x + 4$ ;  $3x - 9$  are three consecutive numbers of an arithmetic sequence. Calculate the value of x

**Question 7 (6 Marks)**

7.1) Given:

$$f(x) = 2x + 3 \text{ and } g(x) = -8$$

Determine:

7.1.1)  $f(5)$  1

7.1.2)  $g(-1)$  1

7.1.3) For which values of  $x$  will  $f(x) = g(x)$  2

7.2) If  $f(x) = \frac{x+1}{2}$ , determine  $3f(2x - 1)$  2

**Question 8 (6 Marks)**

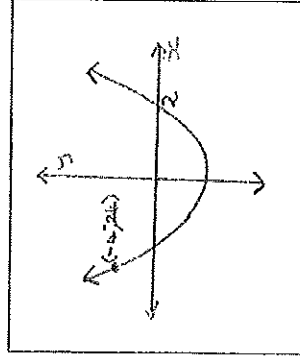
Sketch the following graphs on a separate set of axes

8. 1)  $y = mx + c$  where  $m > 0$  and  $c = 0$  3

8. 2)  $y = ax^2 + c$  where  $a < 0$  and  $c > 0$  3

**Question 9 (6 Marks)**

Given the following parabola in the form  $f(x) = ax^2 + c$



9.1) For which values of  $x$  is  $f(x)$  decreasing? 1

9.2) Does  $f(x)$  have a maximum or minimum? 1

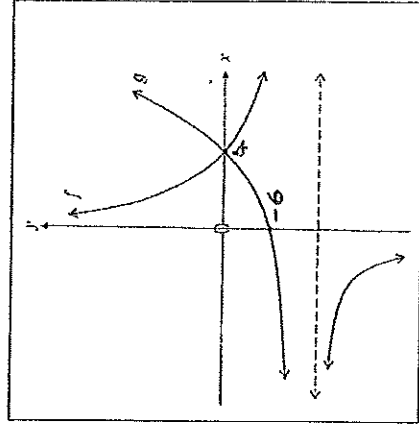
9.3) Determine the values of  $a$  and  $c$  4

**Question 10 (16 Marks)**

Shown below are the graphs of:

$$f(x) = \frac{k}{x} + q \text{ and } g(x) = a.b^x + q$$

$f$  and  $g$  have the same horizontal asymptote  $y = -8$



10.1) Calculate the values of:

10.1.1)  $q$

10.1.2)  $k$

10.1.3)  $a$

10.1.4)  $b$  9

10.2) Use the graphs to solve for  $x$  if:

10.2.1)  $f(x) - g(x) < 0$  2

10.2.2)  $f(x).g(x) \geq 0$  2

10.3) Write down the range of  $g$  1

10.4) State the axis of symmetry of  $h$ , if  $h(x) = f(x)$  ( $x < 0$ ) 2

**Question 11 ( 17 Marks)**

11.1) R 15 200 is deposited into an account of the 1<sup>st</sup> of January 2011. The bank pays 6,2% p.a compounded monthly. Calculate the balance in the account on the 31 October 2013 4

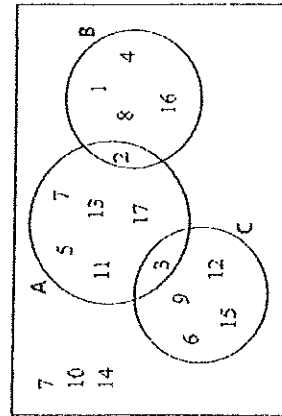
11.2) A car costs R250 000 in 2014, in two years' time the same car will cost R 325 000. What is the rate of inflation, as a percent? 3

11.3) How many years will it take an investment earning 8% p.a compound interest to triple in value? 4

11.4) A couple buys a home entertainment system to the value of R35 000. They put down a 15% deposit and pay off the balance using a higher purchase agreement, over 3 years. The institution charges interest of 11% p.a and a monthly insurance fee of R55. Calculate the couple's monthly repayments 5

**Question 12 ( 15 Marks)**

12.1) In an experiment learners are asked to pick a number from 1 to 17. Event A represents all the prime numbers, Events B represents factors of 16 and Event C multiples of 3. Below is the Venn diagram representing the data.



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Determine:

- 12.1.1)  $P(A \text{ only})$  2
- 12.1.2)  $P(A \cap C)$  1
- 12.1.3)  $P(A \cup B)$  1
- 12.1.4)  $P(A')$  1

12.2) A small rural hospital has only 500 beds to serve the community. At present

- 263 patients suffering from AIDS
  - 196 with TB
  - 65 with chronic Diabetes.
- Furthermore:
- 44 have AIDS and Diabetes,
  - 120 have both AIDS and TB,
  - 7 have TB and Chronic Diabetes but not AIDS
  - 15 have all three diseases

Draw a Venn diagram to illustrate this state of affairs. 5

12.3) Two events A and B are mutually exclusive

$P(B') = 0,4$   
 $P(A \cup B) = 0,7$

12.3.1) Calculate  $P(A)$  2

12.3.2) Are the events complementary? Justify your answer. 3

Total 150