

GRADE 10
NOVEMBER PAPER 1 EXAMINATION PAPERS
2012 - 2019

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QUESTION 1

1.1 Simplify the following expressions fully:

1.1.1 $(m - 2n)(m^2 - 6mn - n^2)$ (3)

1.1.2 $\frac{x^3 + 1}{x^2 - x + 1} - \frac{4x^2 - 3x - 1}{4x + 1}$ (5)

1.2 Factorise the following expressions fully:

1.2.1 $6x^2 - 7x - 20$ (2)

1.2.2 $a^2 + a - 2ab - 2b$ (3)

1.3 Determine, **without the use of a calculator**, between which two consecutive integers $\sqrt{51}$ lies. (2)

1.4 Prove that $0,\dot{2}4\dot{5}$ is rational. (4)
[19]

QUESTION 2

2.1 Determine, **without the use of a calculator**, the value of x in each of the following:

2.1.1 $x^2 - 4x = 21$ (3)

2.1.2 $96 = 3x^{\frac{5}{4}}$ (3)

2.1.3 $R = \frac{2\sqrt{x}}{3S}$ (2)

2.2 Solve for p and q simultaneously if:

$$\begin{aligned} 6q + 7p &= 3 \\ 2q + p &= 5 \end{aligned}$$

(5)
[13]

QUESTION 3

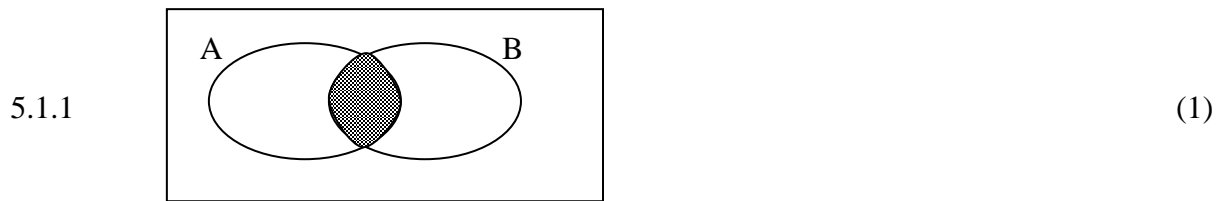
- 3.1 $3x + 1$; $2x$; $3x - 7$ are the first three terms of a linear number pattern.
- 3.1.1 If the value of x is three, write down the **FIRST THREE** terms. (3)
- 3.1.2 Determine the formula for T_n , the general term of the sequence. (2)
- 3.1.3 Which term in the sequence is the first to be less than -31 ? (3)
- 3.2 The multiples of three form the number pattern: 3 ; 6 ; 9 ; 12 ; ...
Determine the 13th number in this pattern that is even. (3)
- [11]**

QUESTION 4

- 4.1 Thando has R4 500 in his savings account. The bank pays him a compound interest rate of 4,25% p.a. Calculate the amount Thando will receive if he decides to withdraw the money after 30 months. (3)
- 4.2 The following advertisement appeared with regard to buying a bicycle on a hire-purchase agreement loan:
- | | |
|-------------------------|---|
| <i>Purchase price</i> | <i>R5 999</i> |
| <i>Required deposit</i> | <i>R600</i> |
| <i>Loan term</i> | <i>Only 18 months, at 8% p.a. simple interest</i> |
- 4.2.1 Calculate the monthly amount that a person has to budget for in order to pay for the bicycle. (6)
- 4.2.2 How much interest does one have to pay over the full term of the loan? (1)
- 4.3 The following information is given:
- 1 ounce = 28,35 g
\$1 = R8,79
- Calculate the rand value of a 1 kg gold bar, if 1 ounce of gold is worth \$978, 34. (4)
- [14]**

QUESTION 5

5.1 What expression BEST represents the shaded area of the following Venn diagrams?



5.2 State which of the following sets of events is mutually exclusive:

- A Event 1: The learners in Grade 10 in the swimming team
Event 2: The learners in Grade 10 in the debating team
- B Event 1: The learners in Grade 8
Event 2: The learners in Grade 12
- C Event 1: The learners who take Mathematics in Grade 10
Event 2: The learners who take Physical Sciences in Grade 10 (1)

5.3 In a class of 40 learners the following information is TRUE:

- 7 learners are left-handed
- 18 learners play soccer
- 4 learners play soccer and are left-handed
- All 40 learners are either right-handed or left-handed

Let L be the set of all left-handed people and S be the set of all learners who play soccer.

5.3.1 How many learners in the class are right-handed and do NOT play soccer? (1)

5.3.2 Draw a Venn diagram to represent the above information. (4)

5.3.3 Determine the probability that a learner is:

(a) Left-handed or plays soccer (3)

(b) Right-handed and plays soccer (2)

[13]

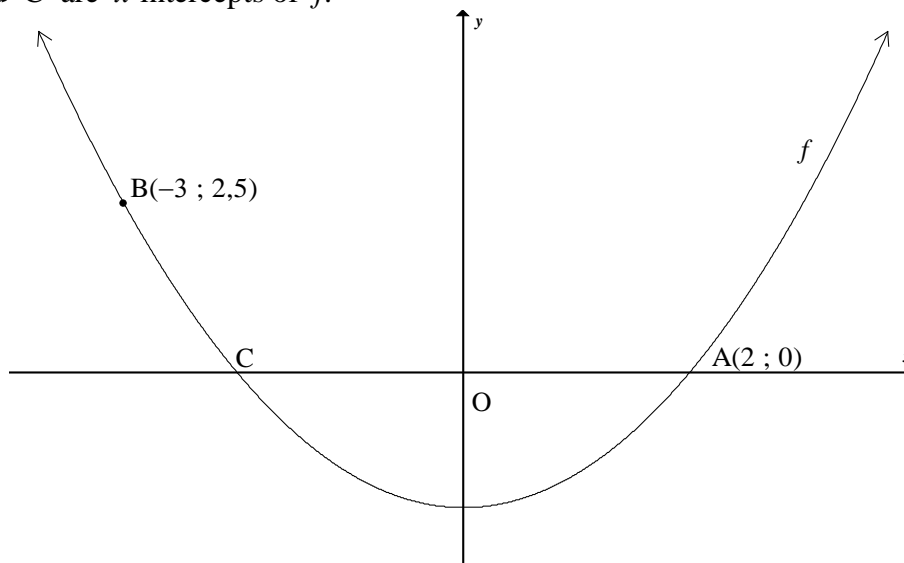
QUESTION 6

Given: $f(x) = \frac{3}{x} + 1$ and $g(x) = -2x - 4$

- 6.1 Sketch the graphs of f and g on the same set of axes. (4)
- 6.2 Write down the equations of the asymptotes of f . (2)
- 6.3 Write down the domain of f . (2)
- 6.4 Solve for x if $f(x) = g(x)$. (5)
- 6.5 Determine the values of x for which $-1 \leq g(x) < 3$. (3)
- 6.6 Determine the y -intercept of k if $k(x) = 2g(x)$. (2)
- 6.7 Write down the coordinates of the x - and y -intercepts of h if h is the graph of g reflected about the y -axis. (2)
- [20]**

QUESTION 7

The graph of $f(x) = ax^2 + q$ is sketched below.
Points A(2 ; 0) and B(-3 ; 2,5) lie on the graph of f .
Points A and C are x -intercepts of f .



- 7.1 Write down the coordinates of C. (1)
- 7.2 Determine the equation of f . (3)
- 7.3 Write down the range of f . (1)
- 7.4 Write down the range of h , where $h(x) = -f(x) - 2$. (2)
- 7.5 Determine the equation of an exponential function, $g(x) = b^x + q$, with range $y > -4$ and which passes through the point A. (3)

[10]**TOTAL: 100**



ALEXANDER ROAD HIGH SCHOOL

NOVEMBER 2013

2 HOURS

MATHEMATICS – PAPER ONE

SH

TOTAL =100

GRADE 10

INSTRUCTIONS

1. This paper consists of questions. Answer all the questions.
2. Calculators may be used, unless stated otherwise.
3. If necessary, round off answers to TWO decimal places.

QUESTION 1

- 1.1 Determine, **without the use of a calculator**, between which two consecutive integers $\sqrt{44}$ lies. (2)
- 1.2 Simplify the following expressions fully:
- 1.2.1 $(x - 3y)(x^2 - 5xy - y^2)$ (3)
- 1.2.2 $\frac{a^3 - 1}{a^2 + a + 1} - \frac{5a^2 + 4a - 1}{5a - 1}$ (5)
- 1.2.3 $\frac{3^{x+3} - 7 \cdot 3^x}{3^{x-1}}$ (4)
- 1.3 Factorise the following expressions fully:
- 1.3.1 $8p^2 - 22p - 21$ (2)
- 1.3.2 $k^2 - 6ky - 24y + 4k$ (3)
- [19]**

QUESTION 2

- 2.1 Determine, **without the use of a calculator**, the value of x in each of the following:
- 2.1.1 $x^2 - x = 12$ (3)
- 2.1.2 $3\sqrt{x} = 18$ (2)
- 2.1.3 $-6 < -3x < 3$ (2)

2.2 Solve for x and y simultaneously if:

$$6x + 4y = 5 \quad \text{and}$$

$$\frac{x}{3} - \frac{y}{2} = 1 \quad (5)$$

[12]

QUESTION 3

3.1 You are given the sequence: $11 ; 7 ; 3 ; -1 ; \dots$

3.1.1 Write down the next two terms in the sequence. (1)

3.1.2 Work out the general term, T_n , for the sequence. (2)

3.1.3 Which term in the sequence would be equal to -57 ? (2)

3.2 If $T_n = 2n^2 + 1$, find the value of the third term. (2)

3.3 The following are the first three terms in a linear sequence. Use this fact to work out the value of x :

$$2x - 1 ; 4x - 3 ; 3x + 4 ; \dots$$

(Hint: a linear sequence has a common difference between terms) (4)
[11]

QUESTION 4

4.1 Mrs van Zyl wants to buy a fridge that costs R4 999. She enters into a hire purchase agreement with the store, in terms of which she has to pay a deposit of 10% of the purchase price. She is charged an interest rate of 16,5% p.a. on the loan and she must pay the loan back over 2 years.

4.1.1 What is the full amount Mrs van Zyl has to pay back? (4)

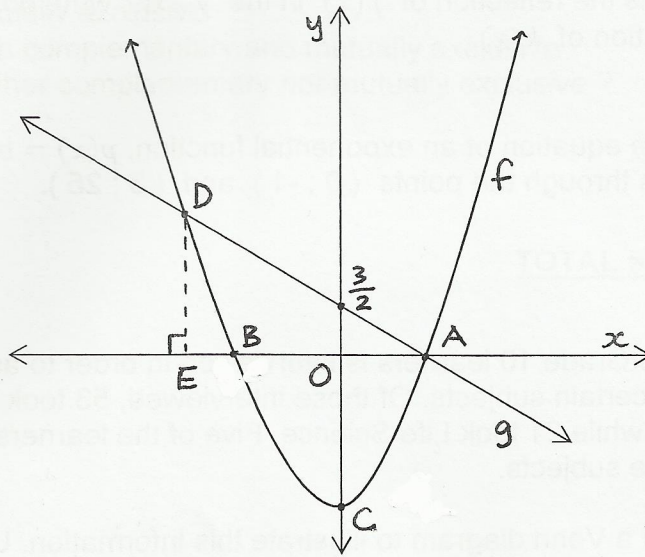
4.1.2 What would her monthly instalments be? (2)

4.2 Lwando invests R8 500. The bank pays him a compound interest rate of 4,5% p.a. However, after 3 years, he withdraws R1 500 to pay for unexpected expenses. How much money will he have in his account at the end of 5 years and 3 months? (5)

4.3 The price of platinum, in dollars, is \$44 550 per kilogram. Julius wants to buy 250 grams of the metal as an investment. If the exchange rate is \$1 = R9,97, how much will this cost him in rands? (3)
[14]

QUESTION 5

- 5.1 The sketch below represents the graphs of $f(x) = x^2 - \frac{9}{4}$ and $g(x)$.
 A and B are the x intercepts of f , while C is the y intercept of f . The two graphs intersect at A and D. E lies on the x -axis and DE is parallel to the y -axis.



- 5.1.1 What is the minimum value of $f(x)$? (1)
- 5.1.2 Work out the co-ordinates of A. (2)
- 5.1.3 Determine the equation that defines g . (2)
- 5.1.4 If you are given that the distance $OE = \frac{5}{2}$ units, calculate the co-ordinates of D. (3)
- 5.1.5 Write down the values of x for which $f(x) = g(x)$. (2)
- 5.1.6 If $h(x)$ is $-2f(x)$, write down the equation of $h(x)$. (2)
- 5.1.7 Would $h(x)$ have a minimum value or a maximum value? (1)

[13]

QUESTION 6

- 6.1 You are given the function $f(x) = \frac{5}{x} - 1$.
- 6.1.1 Write down the equations of the asymptotes of this graph. (2)
- 6.1.2 Sketch the graph of $f(x)$. Any intercepts with the axes must be shown. (3)
- 6.1.3 What is the domain of f ? (2)
- 6.1.4 If k is the reflection of $f(x)$ in the y -axis, write down the equation of $k(x)$. (2)
- 6.2 Determine the equation of an exponential function, $p(x) = b^x + q$, which passes through the points $(0; -1)$ and $(3; 25)$. (4)

[13]**QUESTION 7**

- 7.1 A group of 60 Grade 10 learners is interviewed in order to ascertain the popularity of certain subjects. Of those interviewed, 53 took Mathematics as a subject, while 21 took Life Science. Five of the learners did not take either of those subjects.
- 7.1.1 Draw a Venn diagram to illustrate this information. Use the letter M to represent the set Mathematics and the letter L to represent the set Life Science. (5)
- 7.1.2 What is n (Life Science only)? (1)
- 7.1.3 What is the probability that a learner takes Mathematics and Life Science? (2)
- 7.1.4 What is the probability that a learner takes Mathematics or Life Science? (2)
- 7.2 A survey done at the Heart over a one week period found that the probability of choosing different soft drinks was:
- $P(\text{Coke}) = \frac{1}{2}$ $P(\text{Aquelle}) = \frac{1}{4}$ $P(\text{Fanta}) = \frac{1}{20}$
- $P(\text{Energade}) = \frac{1}{10}$
- 7.2.1 Were these the only soft drinks that were bought? Briefly explain your answer. (3)

7.2.2 Over that week 160 soft drinks in total were sold altogether. How many of them would have been Fantas? (2)

7.2.3 What is the probability that a soft drink bought that week would not have been Coke? (1)

7.3 You are given the sample space: all the integers from 1 to 10. Consider the event E (choosing an even number) and the event O (choosing an odd number). Which of the following describes the two events E and O:

- a) complementary
 - b) mutually exclusive
 - c) both complementary and mutually exclusive
 - d) neither complementary nor mutually exclusive ?
- (2)
[18]

TOTAL = 100



NOVEMBER 2014
SH

ALEXANDER ROAD HIGH SCHOOL
MATHEMATICS – PAPER ONE
GRADE 10

2 HOURS
TOTAL =100

INSTRUCTIONS:

- 1) This paper consists of 8 questions. Answer all the questions.
 - 2) Clearly show ALL calculations you have used in determining your answers.
 - 3) Answers are to be rounded off, where appropriate, to 2 decimal places.
 - 4) Calculators may be used, unless stated otherwise in a particular question.
-

QUESTION 1

- 1.1 Determine the following product:

$$(2x - 3)(x^2 + 2x - 3) \quad (3)$$

- 1.2 Factorise the following:

$$6x^2 + y - 3x - 2xy \quad (3)$$

- 1.3 Simplify the following, using factorising:

$$\frac{12x^2 + 18xy + 27y^2}{2x^2 + 3xy} \div \frac{8x^3 - 27y^3}{4x^2 - 9y^2} \quad (7)$$

[13]

QUESTION 2

Simplify the following WITHOUT A CALCULATOR. Where necessary, answers must be given with positive exponents.

2.1 $\left[\frac{(2a)^{-2}}{2a^{-2}} \right]^{-2} \quad (4)$

$$2.2 \quad \frac{5^n \cdot 15^{n-1} \cdot 3^n}{25^n \cdot 9^{n-1}} \quad (5) \quad 11$$

[9]

QUESTION 3

3.1 Solve the following questions for x :

$$3.1.1 \quad x^2 + 3x - 54 = 0 \quad (2)$$

$$3.1.2 \quad 2 \times 5^{2-x} = 250 \quad (3)$$

$$3.1.3 \quad \frac{x-1}{x-2} + \frac{x}{2-x} = \frac{3x}{x^2-4} \quad (6)$$

3.2 Solve the following equations simultaneously for x and y :

$$x - y = 1 \quad \text{and} \quad 3y + 5x = 21 \quad (5)$$

[16]

QUESTION 4

4.1 Write down the next two terms for the following sequence:

$$2; \frac{1}{2}; 2; \frac{1}{4}; 2; \frac{1}{8}; \dots \quad (2)$$

4.2 The sequence $-2a; -4a; -8a; -16a; \dots$ is given.

Which term in the sequence is equal to $-256a$? (2)

4.3 Consider the pattern: $-13; -10; -7; -4; \dots$

4.3.1 Write down the next two terms in the sequence. (1)

4.3.2 Write down the n th term (T_n) for the sequence. (2)

[7]

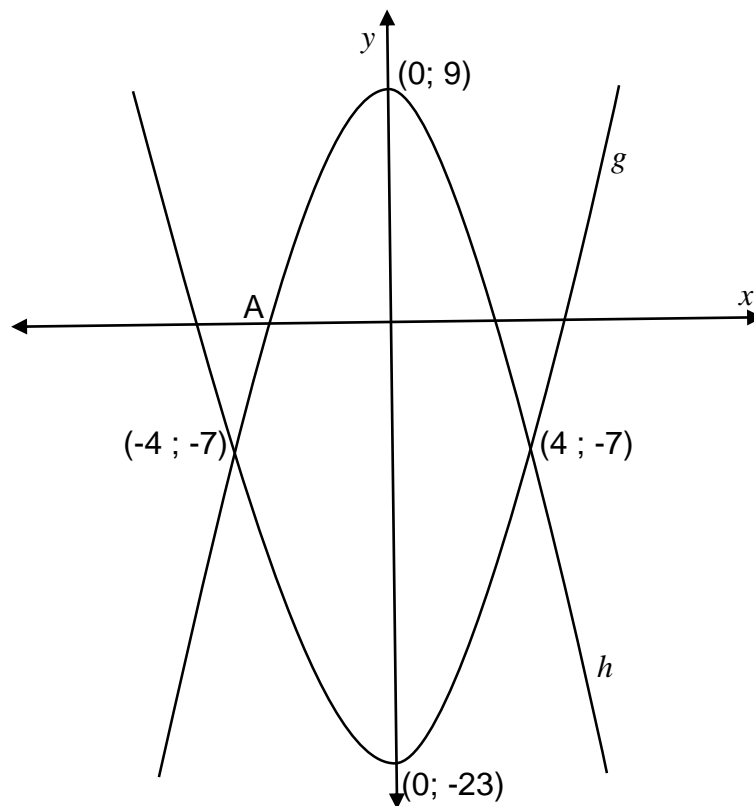
QUESTION 5

5.1 Themba started work and moved in to a flat. He bought himself R75 000 worth of furniture and appliances on hire purchase. He did not need to pay a deposit. The interest rate charged was 17% p.a. simple interest and the loan had to be paid back over 5 years. What monthly instalment would he have to pay in order to repay the loan in 5 years? (3)

- 5.2 Nicola planned to have saved enough money by the 31st December 2014 to go to Korea in 2015 to teach English. She estimated that her costs for travel and all other arrangements would amount to R22 000. She invested R15 000 five years ago (on 31st December 2009). The bank paid her an interest rate of 12% p.a., compounded annually, on her investment. However, she had unforeseen expenses two years before the end of the investment period and had to withdraw R3 000 from her account. Would she still have had enough money at the end of 2014 to cover the trip? Show all calculations necessary to support your answer. (5)
- [8]**

QUESTION 6

- 6.1 The sketch below, which is not drawn to scale, illustrates two parabolas $h(x) = -x^2 + 9$ and $g(x) = ax^2 + p$. The point A is one of the x intercepts of h . The two graphs intersect at the points $(-4 ; -7)$ and $(4 ; -7)$. The y intercept of g is the point $(0 ; -23)$

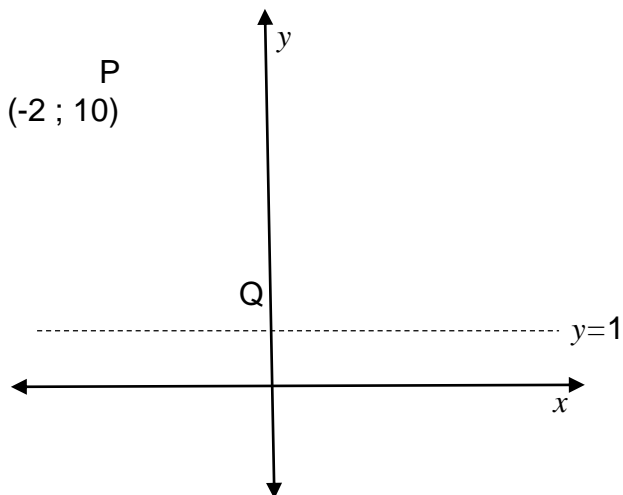


- 6.1.1 Calculate the co-ordinates of A. (2)
- 6.1.2 Write down the value of p . (1)
- 6.1.3 Show why the value of a is equal to 1. (2)

6.1.4 For what values of x is $g(x) \leq h(x)$?

(2)

6.2 The sketch below illustrates the graph of $f(x) = k^x + q$. The point $P(-2 ; 10)$ lies on the graph and the graph cuts the y axis at Q .



6.2.1 Work out the values of q and k and hence write down the equation of the function. (5)

6.2.2 Write down the y value of point Q . (1)

6.2.3 If g is the reflection of f in the y -axis, write down the equation of g . (2)

[15]

QUESTION 7

The following functions are given: $p(x) = \frac{4}{x} - 3$ and $q(x) = x - 3$

7.1 Write down the equations of the asymptotes of p . (2)

7.2 Calculate the x intercept of p . (2)

7.3 Calculate the co-ordinates of the points of intersection of p and q . (6)

7.4 On the same system of axes, draw neat sketch graphs of p and q . (6)

[16]

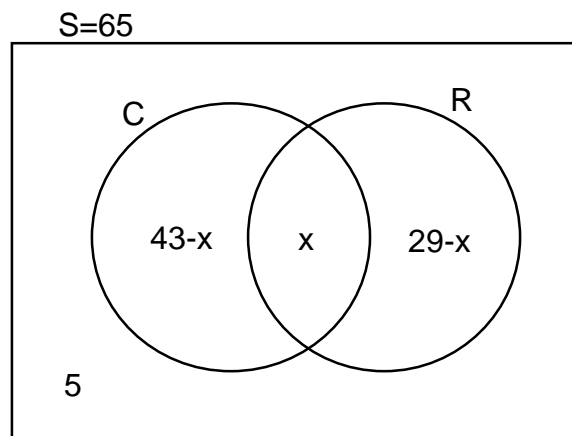
QUESTION 8

8.1 Twelve cards with different pictures on the back are taken out of a pack of cards. Four of the cards have flowers on the back, four have animals and the other four have famous people on the back. You have two chances to pick a card at random from these 12 cards. Each card you pick is not replaced.

8.1.1 Using the letter F to represent the cards with flowers on the back, A to represent those with animals, and P to represent those with people on the reverse, draw a tree diagram illustrating the outcomes. (3)

8.1.2 Use your diagram to work out the probability that you will pick any two cards with the same pictures on the back. (3)

8.2 65 Grade 10 boys were questioned about the sports they play. 43 said they played cricket while 29 said that they played rugby. 5 did not play either sport. Those playing cricket are represented by the set labelled C and those playing rugby by the letter R. The Venn diagram drawn below illustrates this:



8.2.1 Calculate the numerical value of x . (2)

8.2.2 What is $n(C \cup R)$? (1)

8.2.3 What is $P(R \text{ only})$? (2)

8.2.4 What is $P(C \text{ or } R)$? (2)

8.2.5 Now find: $P(C) + P(R) - P(C \text{ and } R)$. (3)

[16]

TOTAL = 100

QUESTION 1

1.1 Factorise the following expressions fully:

1.1.1 $x^4 - 81$ (2)

1.1.2 $6x^2y - 10xy + 15x - 25$ (3)

1.2 Simplify the following expressions fully:

1.2.1 $\frac{3}{a-4} + \frac{2}{a+3} - \frac{21}{a^2 - a - 12}$ (5)

1.2.2 $\frac{10^{2x+3} \cdot 4^{1-x}}{25^{2+x}}$ (4)

1.3 Consider the following numbers: $\sqrt{27}$; $\sqrt[3]{-27}$; $\sqrt{-27}$.

Which ONE of these numbers is:

1.3.1 Irrational (1)

1.3.2 Non-real (1)
[16]**QUESTION 2**2.1 Solve for x :

2.1.1 $15x^2 - 8 = 14x$ (4)

2.1.2 $5^x = \frac{1}{125}$ (2)

2.2 The following inequality is given: $3(x+7) < \frac{x}{2} + 1$ 2.2.1 Solve for x in the inequality. (3)

2.2.2 Represent your answer to QUESTION 2.2.1 on a number line. (1)

2.3 Mary gave one third of her money to Nazeem and one fifth of her money to Elwethu. Elwethu received R28 less than Nazeem. How much money did Mary have originally? (4)

[14]



QUESTION 3

3.1 Given the linear number pattern: 8 ; 3 ; -2 ; ...

3.1.1 Write down the NEXT TWO terms of the pattern. (2)

3.1.2 Determine the n^{th} term of the pattern. (2)

3.1.3 Calculate T_{30} , the thirtieth term of the pattern. (2)

3.1.4 Which term of the pattern is equal to -492? (2)

3.2 The first four terms of PATTERN A and PATTERN B are shown in the table below:

Position of term (n)	1	2	3	4
PATTERN A	1	3	5	7
PATTERN B	1	9	25	49

3.2.1 Determine a general formula for the n^{th} term of PATTERN A. (2)

3.2.2 Hence, or otherwise, determine a general formula for the n^{th} term of PATTERN B. (1)

3.2.3 Hence, determine a general formula for the pattern 0 ; -6 ; -20 ; -42 ...
Simplify your answer as far as possible. (4)
[15]

QUESTION 4

$f(x) = -2x^2 + 2$ and $g(x) = 2^x + 1$ are the defining equations of graphs f and g respectively.

4.1 Write down an equation for the asymptote of g . (1)

4.2 Sketch the graphs of f and g on the same set of axes, clearly showing ALL intercepts with the axes, turning points and asymptotes. (6)

4.3 Write down the range of f . (1)

4.4 Determine the maximum value of h if $h(x) = 3^{f(x)}$. (2)

4.5 What transformation does the graph of $y = f(x)$ undergo in order to obtain the graph of $y = 2x^2 - 2$? (2)
[12]



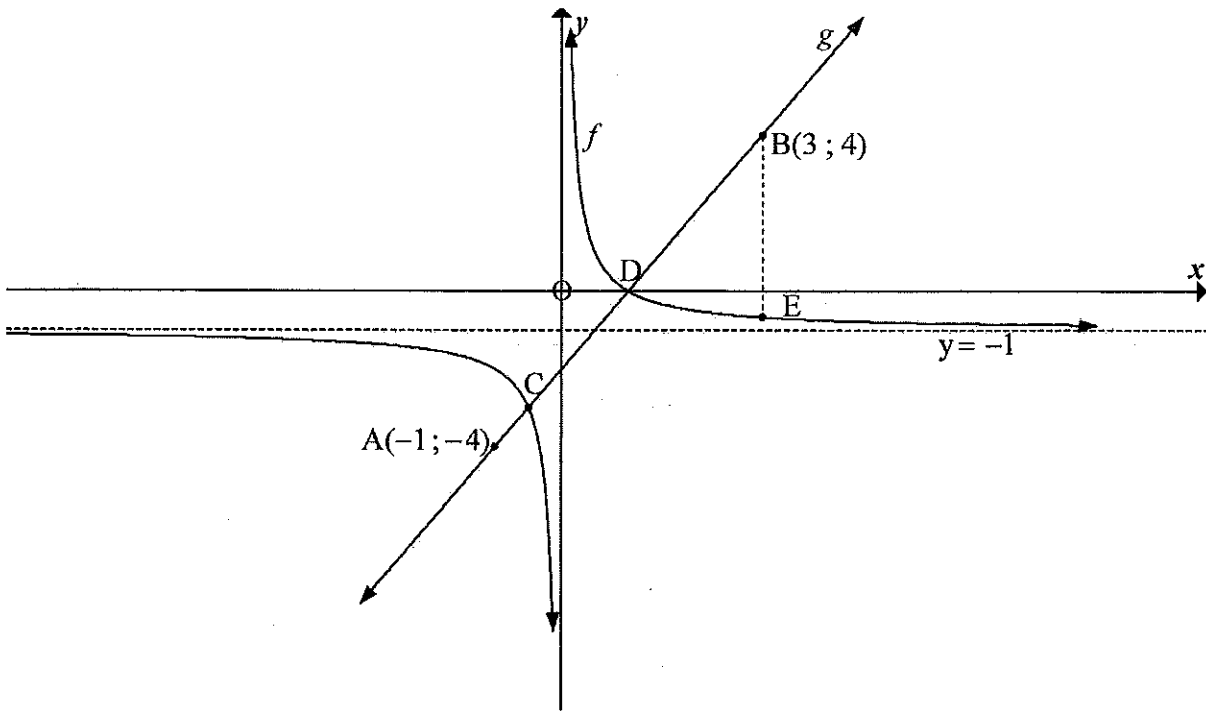
QUESTION 5

The sketch below shows f and g , the graphs of $f(x) = \frac{1}{x} - 1$ and $g(x) = ax + q$ respectively.

Points $A(-1; -4)$ and $B(3; 4)$ lie on the graph g .

The two graphs intersect at points C and D .

Line BE is drawn parallel to the y -axis, with E on f .



- 5.1 Show that $a = 2$ and $q = -2$. (2)
 - 5.2 Determine the values of x for which $f(x) = g(x)$. (4)
 - 5.3 For what values of x is $g(x) \geq f(x)$? (3)
 - 5.4 Calculate the length of BE . (3)
 - 5.5 Write down an equation of h if $h(x) = f(x) + 3$. (1)
- [13]**

QUESTION 6

Given: $f(x) = ax^2 + c$
 f passes through the x -axis at $(d - 5)$ and $(d - 1)$, where $d \in R$.

- 6.1 Determine the value of d . (2)
 - 6.2 Determine the values of a and c if it is also given that $f(1) = -9$. (4)
- [6]**



QUESTION 7

Zach likes to travel. He has saved R5 000 as spending money for his vacation in Australia at the end of 2015.

- 7.1 Zach looks up the exchange rate on the Internet. Using the information in the table below, calculate how many Australian dollars Zach can buy for R5 000.

SOUTH AFRICAN RAND RATES TABLE

FOREIGN CURRENCY	EQUIVALENT VALUE OF R1	RAND EQUIVALENT OF 1 UNIT OF CURRENCY
US dollar	0,083130	12,029313
Euro	0,074048	13,504730
British pound	0,053877	18,560961
Australian dollar	0,105058	9,518569

(2)

- 7.2 Zach plans to make another trip to Australia at the end of 2018.

- 7.2.1 Assume that the average annual rate of inflation in South Africa will be 6,1% over the next 3 years. In 2018, what amount of money will be equivalent to the value of R5 000 now?

(3)

- 7.2.2 Zach plans to invest equal amounts into a savings account on 1 December 2016 and on 1 December 2017 to have accumulated an amount of R5 980 by 1 December 2018. If this account earns interest at 9% p.a. compounded annually, how much money should Zach deposit into the account on each occasion?

(4)

[9]



QUESTION 8

8.1 At a certain school there are 64 boys in Grade 10. Their sport preferences are indicated below:

- 24 boys play soccer
- 28 boys play rugby
- 10 boys play both soccer and rugby
- 22 boys do not play soccer or rugby

8.1.1 Represent the information above in a Venn diagram. (5)

8.1.2 Calculate the probability that a Grade 10 boy at the school, selected at random, plays:

(a) Soccer and rugby (1)

(b) Soccer or rugby (1)

8.1.3 Are the events a Grade 10 boy plays soccer at the school and a Grade 10 boy plays rugby at the school, mutually exclusive? Justify your answer. (2)

8.2 One morning Samuel conducted a survey in his residential area to establish how many passengers, excluding the driver, travel in a car. The results are shown in the table below:

Number of passengers, excluding the driver	0	1	2	3	4
Number of cars	7	11	6	5	1

Calculate the probability that, excluding the driver, there are more than two passengers in a car. (3)

8.3 If you throw two dice at the same time, the probability that a six will be shown on one of the dice is $\frac{10}{36}$ and the probability that a six will be shown on both the dice, is $\frac{1}{36}$. What is the probability that a six will NOT show on either of the dice when you throw two dice at the same time? (3)

[15]

TOTAL: 100



QUESTION 1

1.1 Factorise the following expressions fully:

1.1.1 $x^2 - x$ (1)

1.1.2 $3x^2 + 3px - 2mx - 2mp$ (3)

1.1.3 $2p^2 - 2p - 12$ (3)

1.2 Simplify the following:

1.2.1 $\frac{2^{a+1} - 2^{a-1}}{2^a}$ (3)

1.2.2 $\frac{x^2 - x + 1}{x^3 + 1} \div \frac{2x}{2x + 2}$ (4)
[14]

QUESTION 22.1 Solve for x :

2.1.1 $x(x - 1) = 20$ (4)

2.1.2 $\frac{3x - 2}{2} = x + 1$ (3)

2.2 Given: $-4 \leq -\frac{1}{2}m < 5$ where $m \in R$ 2.2.1 Solve for m . (3)

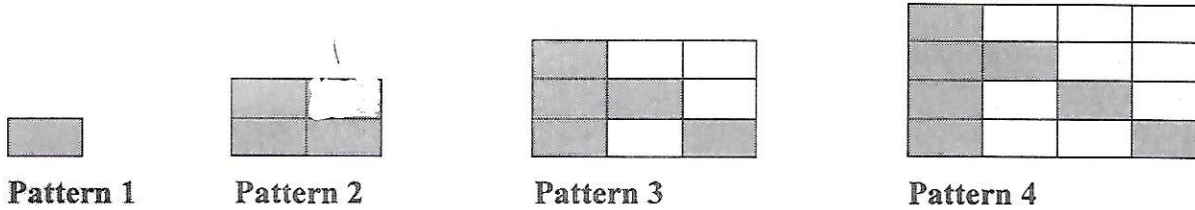
2.2.2 Write the answer to QUESTION 2.2.1 in interval notation. (1)

2.3 Given: $4x^2 - y^2 = 171$ and $2x - y = 9$ 2.3.1 Calculate the value of $2x + y$. (2)2.3.2 Solve simultaneously for x and y . (3)

[16]

QUESTION 3

Dark tiles (D) and light tiles (L) are used to create patterns on a floor. The first four patterns are shown below. For the patterns that follow the tiles are arranged in a similar manner.



- 3.1 How many dark tiles were used in pattern 5? (1)
- 3.2 How many light tiles were used in pattern 6? (1)
- 3.3 Write down the general term (D_n) for the number of dark floor tiles used in each pattern. (2)
- 3.4 * Write down the general term (L_n) for the number of light floor tiles used in each pattern. (2)
- 3.5 * Which pattern will have exactly 64 light floor tiles? (3)
- 3.6 * Each dark tile is 0,3 m wide and 0,6 m long. Calculate the total area covered by all the dark tiles in the first 100 patterns. (3)

[12]

QUESTION 4

4.1 Mary wants to buy a fridge that costs R15 550. She has to pay a deposit of 15% of the cost and the balance by means of a hire-purchase agreement. The rate of interest on the loan is 16,25% p.a. simple interest. The repayment period of the loan is 54 months. In addition to the hire-purchase agreement, an annual insurance premium of 1,5% of the total cost of the fridge should be added. The annual insurance premium should be paid in monthly instalments.

4.1.1 Calculate the value of the loan that Mary will take. (2)

4.1.2 Calculate the total amount that must be repaid on the hire-purchase agreement. (3)

4.1.3 Calculate the monthly repayment, which includes the monthly insurance premium. (3)

4.2 The table below shows the rand equivalent of one British pound and one US dollar.

COUNTRY	CURRENCY	RATE OF EXCHANGE OF THE RAND
Britain (United Kingdom)	Pound (£)	21,41
United States of America	Dollar (\$)	13,45

A South African nurse works in the United States of America.

4.2.1 The nurse saves the equivalent of R4 800 per month. Calculate the amount, in US (American) dollars, that she saves per month. (2)

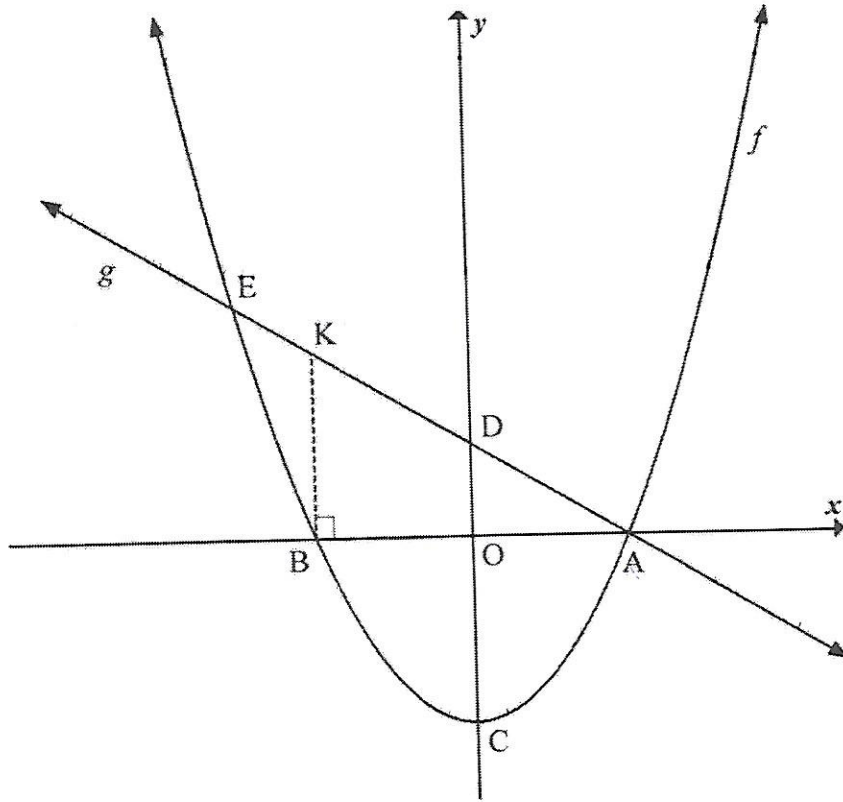
4.2.2 She ordered a book from the United Kingdom (Britain) and paid \$85 for it. Calculate the price of the book in pounds (£). (3)

4.3 A sum of money doubles in 5 years when the interest is compounded annually. Calculate the rate of interest. (3)

[16]

QUESTION 5

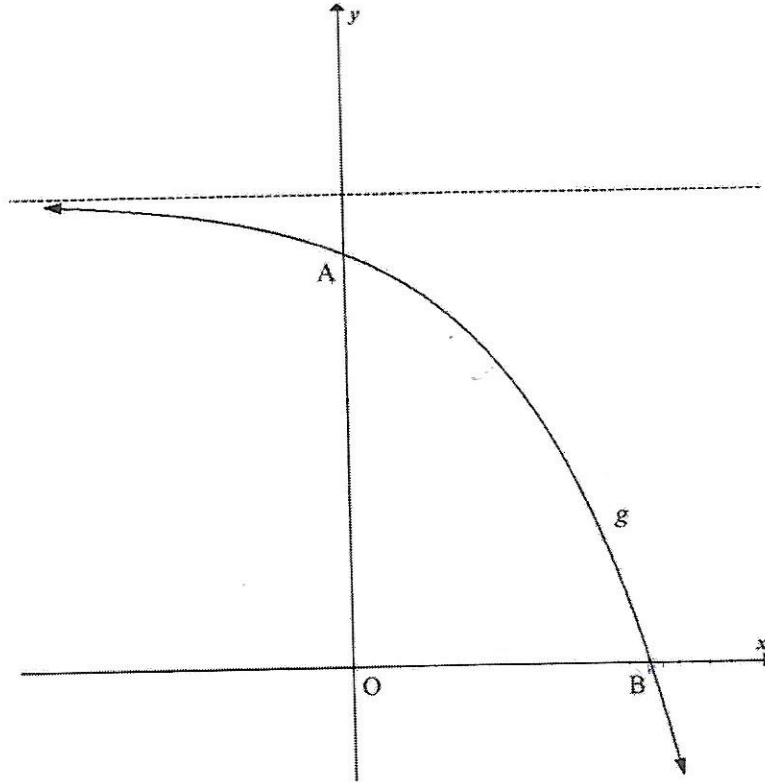
The graphs of $f(x) = x^2 - 4$ and $g(x) = -x + 2$ are sketched below. A and B are the x -intercepts of f . C and D are the y -intercepts of f and g respectively. K is a point on g such that $BK \parallel x$ -axis. f and g intersect at A and E.



- 5.1 Write down the coordinates of C. (1)
- 5.2 Write down the coordinates of D. (1)
- * 5.3 Determine the length of CD. (1)
- 5.4 Calculate the coordinates of B. (3)
- 5.5 Determine the coordinates of E, a point of intersection of f and g . (4)
- 5.6 For which values of x will:
 - 5.6.1 $f(x) < g(x)$ (2)
 - 5.6.2 $f(x).g(x) \geq 0$ (2)
- 5.7 Calculate the length of AK. (4)

QUESTION 6

The graph of $g(x) = -2^x + 8$ is sketched below. A and B are the y - and x -intercepts respectively of g .



- 6.1 Write down the range of g . (1)
- 6.2 Determine the coordinates of B. (3)
- 6.3 If g is reflected over the x -axis to form a new graph h , determine the equation of h . (2)
- 6.4 Explain why the x -intercepts of g and h are both at B. (2)
- [8]

QUESTION 7

A hyperbola, h , is described with the following characteristics:

- The equation of the vertical asymptote is $x = 0$
- The range of h is $(-\infty; 3) \cup (3; \infty)$
- The x -intercept of h is $(2; 0)$

Determine the equation of h .

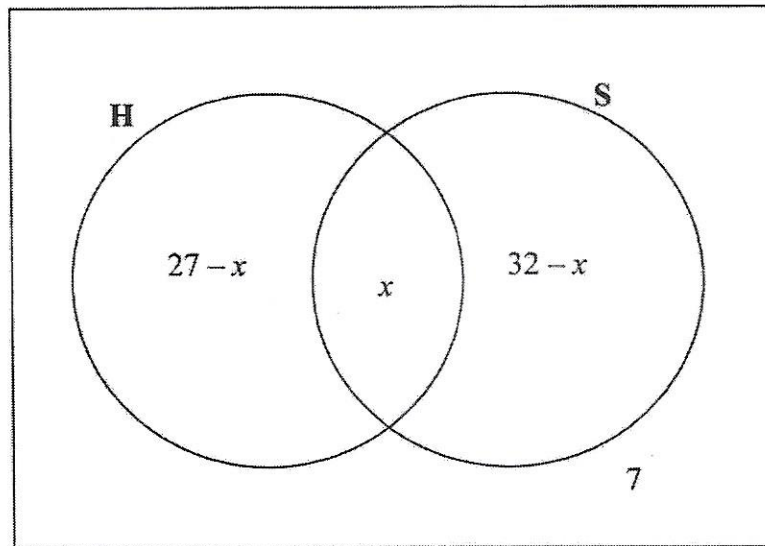
[4]

QUESTION 8

8.1 In a certain class of 42 boys:

- 27 play hockey (H)
- 32 play soccer (S)
- 7 do not play hockey or soccer
- An unknown number (x) play both hockey and soccer

The information is represented in the Venn diagram below.



- 8.1.1 Calculate the value of x . (2)
- 8.1.2 If a boy from the class is chosen at random, calculate the probability that he:
- (a) Does not play hockey or soccer (1)
- (b) Plays only soccer (2)
- 8.2 A bag contains 3 blue balls and x yellow balls.
- 8.2.1 Write down the total number of balls in the bag. (1)
- 8.2.2 If a ball is drawn from the bag, write down the probability that it is blue. (2)
- 8.3 8.3.1 Complete the following statement:
- If A and B are two mutually exclusive events, then $P(A \text{ and } B) = \dots$ (1)
- 8.3.2 Given that A and B are mutually exclusive events. The probability that event A occurs is 0,55. The probability that event B does not occur is 0,7. (3)
- Calculate $P(A \text{ or } B)$. [12]

TOTAL: 100

QUESTION 1

1.1 Given: $q = \sqrt{b^2 - 4ac}$

1.1.1 Determine the value of q if $a = 2$, $b = -1$ and $c = -4$.
Leave your answer in simplest surd form. (2)1.1.2 State whether q is rational or irrational. (1)1.1.3 Between which TWO consecutive integers does q lie? (1)

1.2 Factorise the following expressions fully:

1.2.1 $t^2(r - s) - r + s$ (3)

1.2.2 $\frac{x^3 + 1}{x^2 - x + 1}$ (2)

1.3 Simplify the following completely:

1.3.1 $(2y + 3)(7y^2 - 6y - 8)$ (2)

1.3.2 $\frac{3}{x^2 - 9} + \frac{2}{(x - 3)^2}$ (3)

1.3.3 $\frac{3^t - 3^{t-2}}{2 \cdot 3^t - 3^t}$ (3)
[17]

QUESTION 22.1 Given: $4 - 2x < 16$ where $x \in R$

2.1.1 Solve the inequality. (2)

2.1.2 Hence, represent your answer to QUESTION 2.1.1 on a number line. (1)

2.2 Solve simultaneously for x and y :

$$-2x - y = 10 \text{ and } 3x - 4y = -4$$
 (4)

2.3 Solve for x :

2.3.1 $\frac{x(x - 5)}{6} - 1 = 0$ (3)

2.3.2 $c = \sqrt{a + 2x}$ (2)

2.4 Tabelo is currently four times as old as his daughter, Linda. Six years from now, Tabelo will be three times as old as Linda.

Calculate Linda's age currently. (4)
[16]

QUESTION 3

- 3.1 Consider the linear sequence: $5 ; 8 ; 11 ; b ; 17 ; \dots$
- 3.1.1 Write down the value of b . (2)
- 3.1.2 Determine the n^{th} term of the sequence. (2)
- 3.1.3 Calculate the value of the 15th term of the sequence. (2)
- 3.1.4 Which term in the sequence is equal to 83? (2)
- 3.2 Consider the number pattern below created by using the numbers of the sequence $2 ; 6 ; 10 ; 14 ; 18 ; \dots$

		2		
		6	10	
	14	18	22	
	26	30	34	38
42

- 3.2.1 Calculate the sum of the numbers in the 8th row. (3)
- 3.2.2 Determine the mean of the numbers in the 20th row. (2)
- [13]**

QUESTION 4

- 4.1 Seven years ago, Mrs Grey decided to invest R18 000 in a bank account that paid simple interest at 4,5% p.a.
- 4.1.1 Calculate how much interest Mrs Grey has earned over the 7 years. (2)
- 4.1.2 Mrs Grey wants to buy a television set that costs R27 660,00 now. If the average rate of inflation over the last 5 years was 6,7% p.a., calculate the cost of the television set 5 years ago. (3)
- 4.1.3 At what rate of simple interest should Mrs Grey have invested her money 7 years ago if she intends buying the television set now using only her original investment of R18 000 and the interest earned over the last 7 years? (3)
- 4.2 On a certain day the exchange rate between the US dollar and South African rand is $\$1 = \text{R}12,91$. At the same time the exchange rate between the British pound and the South African rand is $\text{£}1 = \text{R}16,52$.

Calculate the exchange rate between the British pound and US dollar on that day. (2)

[10]

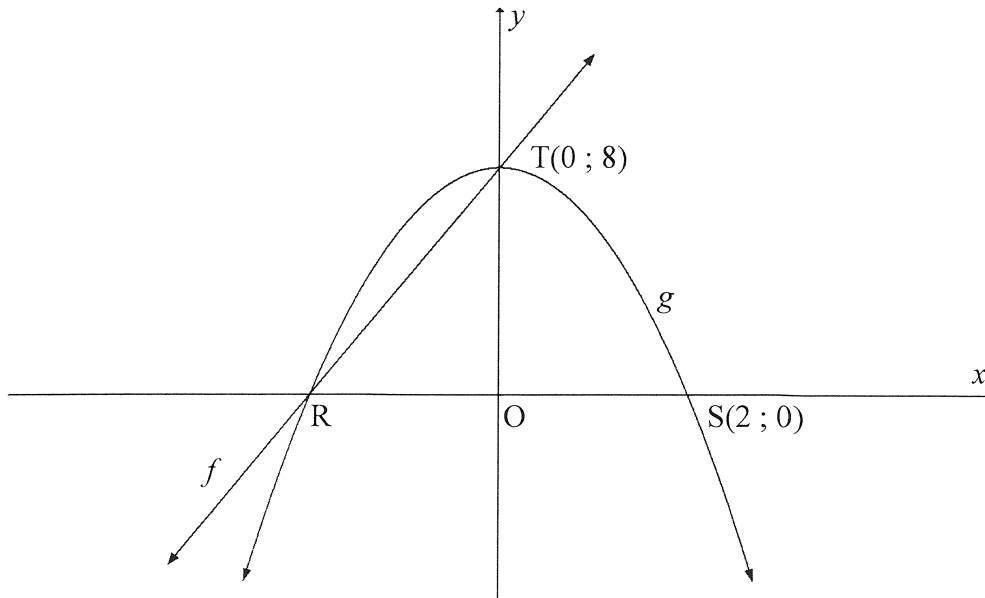


QUESTION 5

The diagram shows the graphs of $g(x) = ax^2 + q$ and $f(x) = mx + c$.

R and S(2 ; 0) are the x -intercepts of g and T(0 ; 8) is the y -intercept of g .

Graph f passes through R and T.



- 5.1 Write down the range of g . (1)
- 5.2 Write down the x -coordinate of R. (1)
- 5.3 Calculate the values of a and q . (3)
- 5.4 Determine the equation of f . (3)
- 5.5 Use the graphs to determine the value(s) of x for which:
- 5.5.1 $f(x) = g(x)$ (2)
- 5.5.2 $x \cdot g(x) \leq 0$ (3)
- 5.6 The graph h is obtained when g is reflected along the line $y = 0$.
Write down the equation of h in the form $h(x) = px^2 + k$. (2)
- [15]**



QUESTION 6

6.1 The function $p(x) = k^x + q$ is described by the following properties:

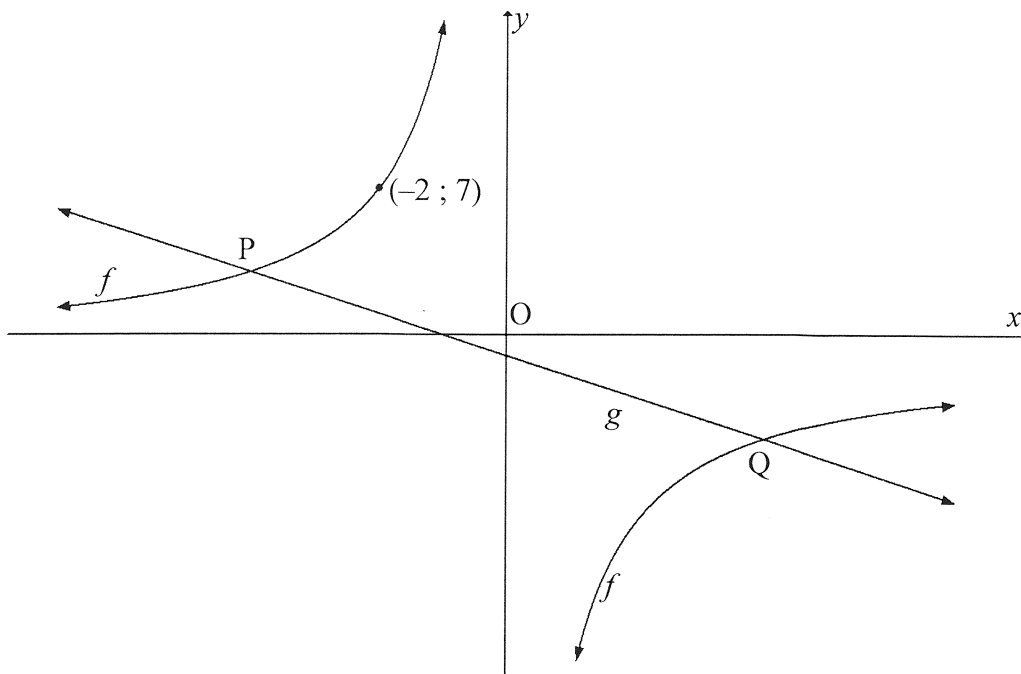
- $k > 0; k \neq 1$
- x -intercept at $(2; 0)$
- The horizontal asymptote is $y = -9$

6.1.1 Write down the range of p . (1)

6.1.2 Determine the equation of p . (3)

6.1.3 Sketch the graph of p . Show clearly the intercepts with the axes and the asymptote. (3)

6.2 The sketch below shows the graphs of $f(x) = \frac{k}{x} + w$ and $g(x) = -x - 1$.
The graph g is an axis of symmetry of f . The graphs f and g intersect at P and Q.



6.2.1 Write down the value of w . (1)

6.2.2 The point $(-2; 7)$ lies on f . Calculate the value of k . (2)

6.2.3 Calculate the x -coordinates of P and Q. (4)

6.2.4 Write down the values of x for which $\frac{-16}{x} > -x$. (2)

[16]



QUESTION 7

7.1 Two events, A and B, are complementary and make up the entire sample space. Also, $P(A') = 0,35$.

7.1.1 Complete the statement: $P(A) + P(B) = \dots$ (1)

7.1.2 Write down the value of $P(A \text{ and } B)$. (1)

7.1.3 Write down the value of $P(B)$. (1)

7.2 A survey was conducted among 150 learners in Grade 10 at a certain school to establish how many of them owned the following devices: smartphone (S) or tablet (T).

The results were as follows:

- 8 learners did not own either a smartphone or a tablet.
- 20 learners owned both a smartphone and a tablet.
- 48 learners owned a tablet.
- x learners owned a smartphone.

7.2.1 Represent the information above in a Venn diagram. (4)

7.2.2 How many learners owned only a smartphone? (3)

7.2.3 Calculate the probability that a learner selected at random from this group:

(a) Owned only a smartphone (1)

(b) Owned at most one type of device (2)

[13]

TOTAL: 100



QUESTION 1

1.1 Factorise the following expressions fully:

1.1.1 $4x - x^3$ (2)

1.1.2 $x^2 + 15x - 54$ (2)

1.1.3 $y - xy + x - 1$ (3)

1.2 Simplify the following expressions fully:

1.2.1 $(x+2)(x^2 - x + 3)$ (2)

1.2.2 $\frac{5}{x+3} - \frac{3}{2-x}$ (3)

1.2.3 $\frac{25^{-x} \cdot 15^{x+1}}{3^x \cdot 5^{-x}}$ (3)

1.3 Determine the value of $(3p+q)^2$ if $9p^2 + q^2 = 12$ and $pq = -3$. (3)
[18]**QUESTION 2**2.1 Solve for x :

2.1.1 $px + qx = a$ (2)

2.1.2 $2x^2 - 5x + 2 = 0$ (3)

2.1.3 $\left(\frac{1}{2}\right)^{3x+1} = 32$ (3)

2.2 Given: $-11 \leq 3m - 8 < 4$ 2.2.1 Solve for m . (2)

2.2.2 Hence, write down the number of integers that satisfy the inequality. (1)

2.3 Solve simultaneously for x and y if:

$$5x + 4y = 21 \text{ and } 2x = 3 - y$$
 (4)
[15]

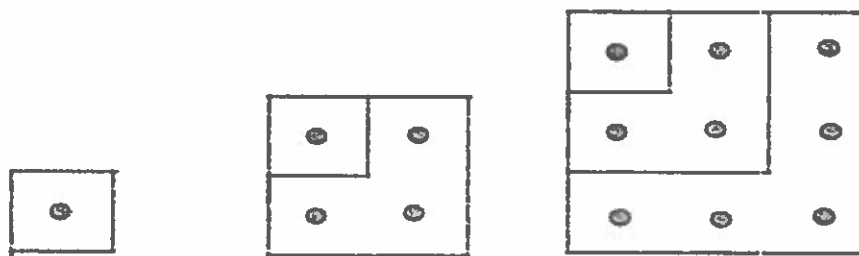
QUESTION 3

Consider the finite linear pattern: 20 ; 17 ; 14 ; ... ; -103

- 3.1 Write down the 4th term of the pattern. (1)
 - 3.2 Determine the expression for the n^{th} term. (2)
 - 3.3 Calculate the number of terms in the sequence. (2)
 - 3.4 Which term is the first to have a negative value? (3)
 - 3.5 What is the value of the 19th even-valued term in the sequence? (2)
- [10]**

QUESTION 4

Samantha is investigating a pattern of dots represented in the diagram below.



Pattern number:	1	2	3
Number of dots:	$1^2 = 1$	$1 + 3 = 2^2 = 4$	$1 + 3 + 5 = 3^2 = 9$

- 4.1 Write down:
 - 4.1.1 The number of dots in the 4th pattern (1)
 - 4.1.2 The number of dots in the 13th pattern (1)
 - 4.1.3 A formula for the number of dots in the n^{th} pattern (1)
- 4.2 Hence, or otherwise, calculate the value of:

$$1 + 3 + 5 + \dots + 43$$

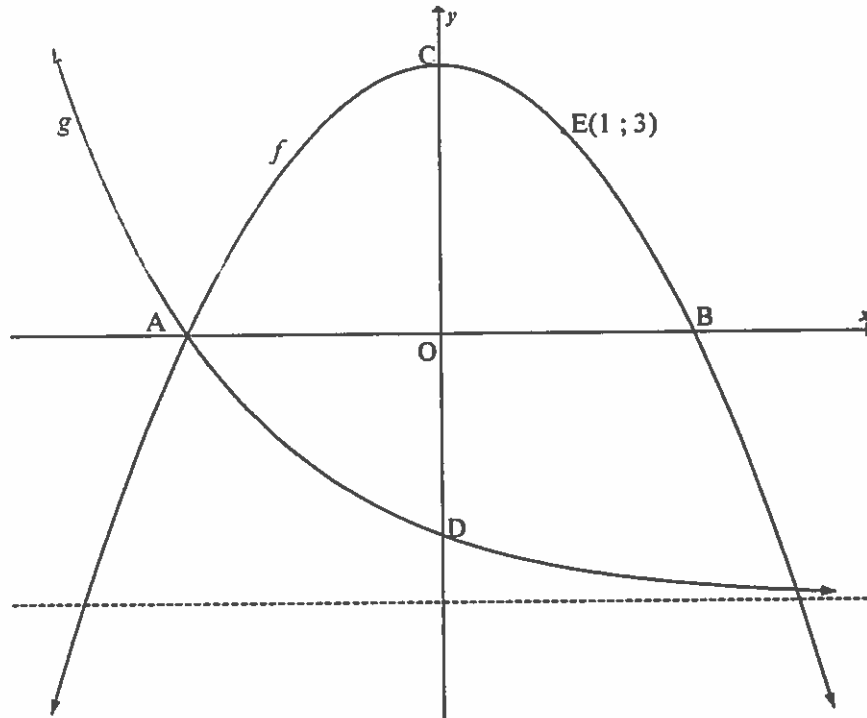
(3)
[6]



QUESTION 5

Sketched below are the graphs of $f(x) = ax^2 + q$ and $g(x) = \left(\frac{1}{2}\right)^x - 4$.

A and B are the x -intercepts of f . The graphs intersect at A and point E (1 ; 3) lies on f .
C is the turning point of f and D is the y -intercept of g .



- 5.1 Write down the:
 - 5.1.1 Coordinates of D (2)
 - 5.1.2 Range of g (1)
- 5.2 Calculate the:
 - 5.2.1 Coordinates of A (2)
 - 5.2.2 Values of a and q (4)
- 5.3 Determine the:
 - 5.3.1 Length of CD (2)
 - 5.3.2 Equation of a straight line through A and D (3)
- 5.4 For which values of x is:
 - 5.4.1 $f(x) > 0$? (2)
 - 5.4.2 f decreasing? (1)

[17]



QUESTION 6

The equation of the function $g(x) = \frac{a}{x} + q$ passes through the point (3; 2) and has a range of $y \in (-\infty; 1) \cup (1; \infty)$.

- 6.1 Determine the:
- 6.1.1 Equation of g (3)
- 6.1.2 Equation of h , the axis of symmetry of g which has a positive gradient (2)
- 6.2 Sketch the graphs of g and h on the same system of axes. Clearly show ALL the asymptotes and intercepts with axes. (4)
- 6.3 Write the equations of the asymptotes of f if $f(x) = -g(x) + 5$. (3)
- [12]

QUESTION 7

Read the advertisement below.

**Buy a Samsung J5 for only
R229 per month.**

**You have 24 months to pay.
No deposit is required.**

- 7.1 Calculate the total amount to be paid over a period of 24 months. (1)
- 7.2 The monthly instalment, quoted in the advertisement, is calculated on a hire purchase agreement which charges interest of 7,5% p.a. on the cash price of the cellphone. Show that the price of the cellphone is R4 779,13. (2)
- 7.3 Calculate the total interest paid over a period of 24 months if the cellphone is bought with this hire purchase agreement. (1)
- 7.4 The cellphone is insured at 11,5% p.a. of the cash price. The total insurance is calculated and then split up over 24 months. It is then added to the monthly instalment. Calculate the new monthly instalment if the customer wants to insure the cellphone. (3)
- 7.5 The cost of the cellphone is subject to inflation and increases to a cash price of R5 100,00 after 2 years. Calculate the annual inflation rate. (4)
- [11]

QUESTION 8

8.1 In a random physical sciences experiment, A and B are two different events. It was found that:

$$P(A) = \frac{2}{5}, P(B') = \frac{3}{8} \text{ and } P(A \text{ or } B) = \frac{5}{7}$$

8.1.1 Calculate:

(a) $P(B)$ (2)

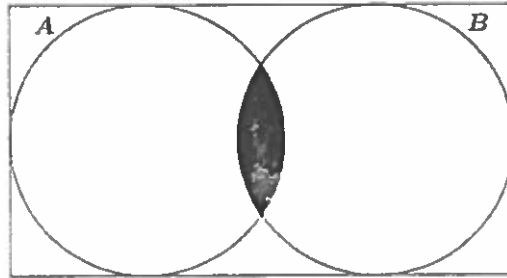
(b) $P(A \text{ and } B)$ (3)

8.1.2 Hence, determine whether events A and B are mutually exclusive. Motivate your answer. (2)

8.2 The Venn diagrams below represent different scenarios of events A and B.

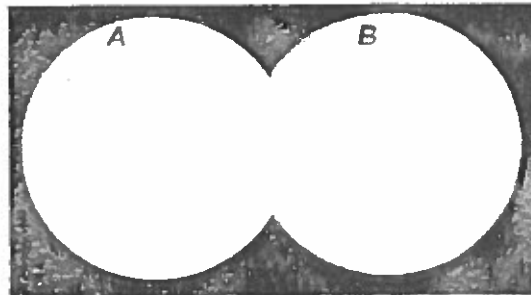
Write down the probability of the shaded region for EACH of the diagrams below.

8.2.1



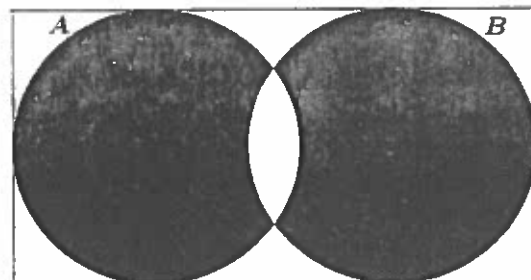
(1)

8.2.2



(1)

8.2.3



(1)

8.3 Which diagram(s) in QUESTIONS 8.2.1, 8.2.2 or 8.2.3 represent mutually exclusive events? (1)
[11]

TOTAL: 100

QUESTION 1

1.1 Given the expression: $P = \sqrt{\frac{-5}{x-2}}$. For which values of x will P be:

1.1.1 Undefined (1)

1.1.2 Real (2)

1.2 Simplify the following expressions fully. Leave your answers with a positive exponent where necessary.

1.2.1 $(a-2)(a^2+2a+4)$ (2)

1.2.2 $\left(\frac{a}{2}+1\right)\left(\frac{a}{2}-1\right)$ (2)

1.3 Factorise the following expressions fully:

1.3.1 $2x^2 - x - 6$ (2)

1.3.2 $a^2 - 2ab + b^2 - 100c^2$ (3)

[12]

QUESTION 2

2.1 Solve for x :

$$x^2 = -5x \quad (3)$$

2.2 Given: $V = \frac{4}{3}\pi(R^3 - r^3)$

Make r the subject of the formula. (5)

2.3 Solve for x if $2(4-3x) \geq 20$ (3)

2.4 Solve the following equations simultaneously for a and b :

$$a + b = 12 \text{ and } 4a + 2b = 44 \quad (5)$$

2.5 Sipho is 7 times older than his son. In 25 years' time, he will be twice as old as his son. By formulating and solving an equation in x , calculate his son's present age. (5)

[21]

QUESTION 3

- 3.1 Consider the pattern: $-1; 2; 5; 8; \dots; 116$
- 3.1.1 Write down T_4 and T_5 of the number pattern. (2)
- 3.1.2 Write down the general formula for the n^{th} term of the sequence. (2)
- 3.1.3 Determine the value of the 33^{rd} term of the sequence. (2)
- 3.1.4 How many terms are there in the sequence if the last term is equal to 116? (3)
- 3.2 A linear number pattern with a constant difference can be represented by the terms: $x + 3; 3x + 2; 6x - 1$. Determine the numerical value x AND the numerical value of the 3^{rd} term. (5)
- [14]**

QUESTION 4

- 4.1 In June 2019, the pound to rand exchange rate was $\text{£}1 = \text{R}18,18$. Zola, travelled to the United Kingdom to watch some WWE wrestling matches. The total cost needed for the trip was $\text{£}3\,569$. Convert this amount into rands. (1)
- 4.2 Sipho bought a brand-new Ford Ranger in April 2015 on hire purchase at a cost of R379 000. He agreed on paying 15% deposit and took out a loan for the remaining balance at an interest rate of 22,5%.
- 4.2.1 How much deposit did Sipho pay? (1)
- 4.2.2 Hence, calculate the initial value of the loan. (1)
- 4.2.3 Calculate the value of the loan with interest in April 2019. (3)
- 4.2.4 Calculate the monthly instalments if he paid off the loan after the four-year period. (2)
- 4.3 A sum of money was invested 6 years ago, earning interest at a rate of 6,7% p.a. compounded annually. The investment is currently worth R 96 714,02. Calculate how much was originally invested 6 years ago. (3)
- [11]**

QUESTION 5

5.1 Given: $f(x) = \frac{1}{2}x + 2$ en $g(x) = 2^x - 1$

5.1.1 Write down the equation of the asymptote of g . (1)

5.1.2 Sketch the graph of f and g on the same set of axes, using the diagram sheet on the last page. Label all relevant points (4)

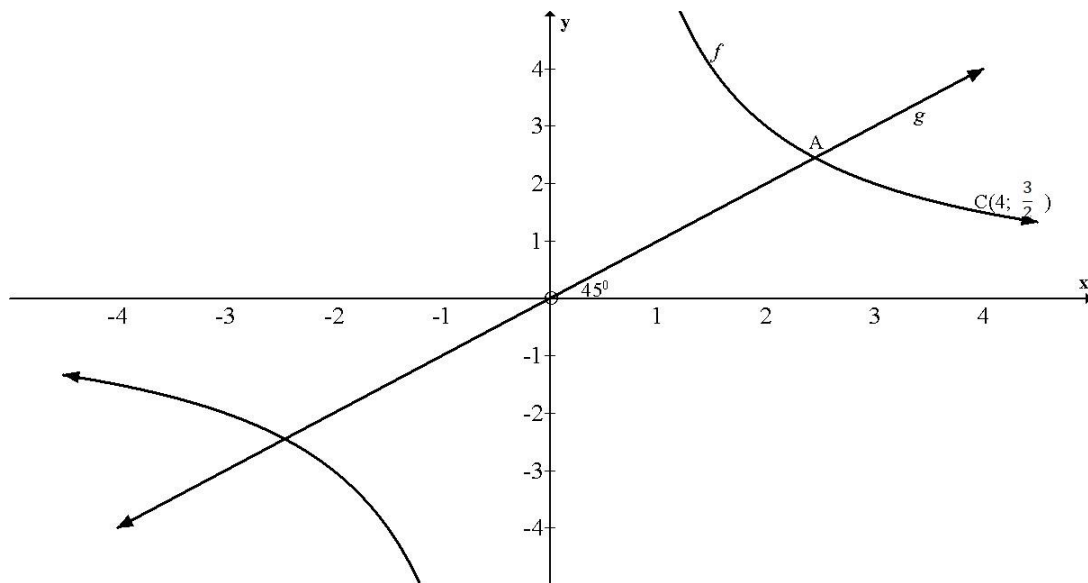
5.1.3 Using your graph, write down the coordinates of ONE point of intersection of f en g in the first quadrant. (2)

5.1.4 Write down the equation of $h(x)$ if $h(x)$ is a reflection of $g(x)$ along the y -axis. (1)

5.1.5 What is the range of $f(x)$? (1)

5.1.6 Determine the value(s) of x for which $f(x) \cdot g(x) \geq 0$ (2)

5.2 In the figure below, the sketch graphs of f and g are given. $C\left(4; \frac{3}{2}\right)$ is a point on the graph of f and A is a point where f and g intersect. The angle between line g and the x -axis is 45° .



5.2.1 Write down the gradient of g . (1)

5.2.2 What is the equation of g ? (1)

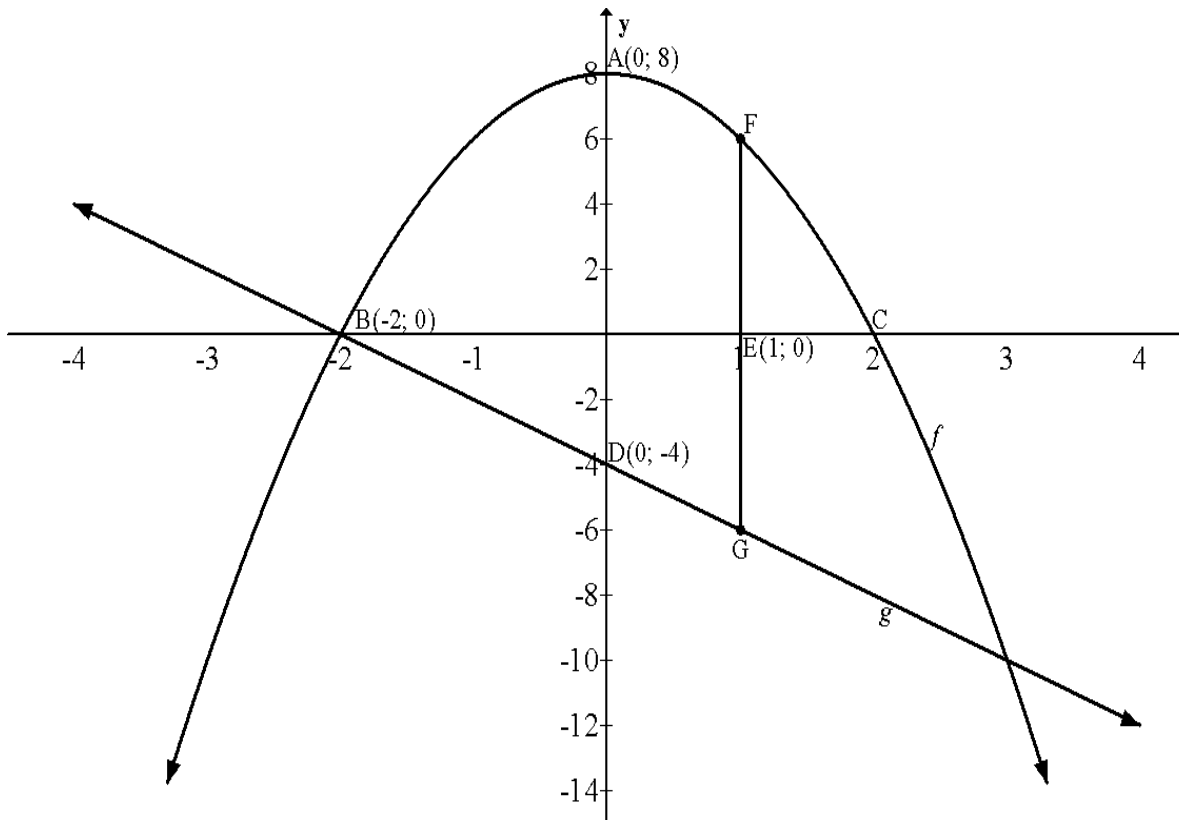
5.2.3 Determine the equation of f . (2)

5.2.4 Determine the coordinates of A , if A is the closest point to the origin. (2)

[17]

QUESTION 6

Given the following diagram.



- 6.1 Determine the equations of the graphs of f and g shown above. (5)
- 6.2 FG is parallel to the y -axis. Determine the length of the vertical line FG . (3)
- 6.3 Write down the range of f . (2)
- 6.4 Determine the value(s) of x for which $f(x) > 0$. (2)

[12]

QUESTION 7

7.1 A letter is chosen at random from the word ALGEBRA. What is the probability that the chosen letter is:

7.1.1 The letter A? (1)

7.1.2 A consonant? (1)

7.2 In a class of 30 learners in Grade 10, the following information is given:

- 5 learners are right-handed.
- 12 learners play soccer
- 3 learners play soccer and are right-handed

Let R be the set of all right-handed learners and S be the set of all learners who play soccer.

7.2.1 Draw a Venn diagram to represent the above information. (5)

7.2.2 Are the events ‘Plays soccer’ and ‘Right-handed’ mutually exclusive? Give a reason for your answer. (2)

7.2.3 How many learners in the class are left-handed and do not play soccer? (2)

7.2.4 Determine the probability that a learner is left-handed and plays soccer. (2)

[13]

TOTAL: 100



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

NOVEMBER 2020

**MATHEMATICS P1
(EXEMPLAR)**

MARKS: 100

TIME: 2 hours

This question paper consists of 7 pages, including a 1-page diagram sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of SEVEN questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. Answers only will NOT necessarily be awarded full marks.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.

QUESTION 1

1.1 Factorise the following expressions fully:

1.1.1 $4y^2 - 16$ (1)

1.1.2 $\frac{x^3 - 1}{x^2 + x + 1}$ (2)

1.1.3 $x - 1 + y - xy$ (2)

1.2 Simplify the following expressions fully:

1.2.1 $\frac{3 - 3x}{x^2 - 3x + 2}$ (3)

1.2.2 $\frac{16^{-x} \cdot 12^{x+1}}{3^x \cdot 4^{-x}}$ (3)

1.3 Given that: $m = x(x - y)^2$

Determine the value of m if $xy^2 = 4$ and $x^3 - 2x^2y = 3$ (3)
[14]

QUESTION 2

2.1 Solve for x without the use of a calculator:

2.1.1 $x^3 = 9x$ (3)

2.1.2 $P = \frac{3}{2}x(PQ^2 - Pq^2)$ (4)

2.1.3 $3x^{\frac{3}{4}} = 81$ (2)

2.2 Solve for x if:

2.2.1 $3(2 - 3x) \geq 15$ (3)

2.2.2 Hence, represent your answer to QUESTION 2.2.1 on a number line. (1)

2.3 Solve simultaneously for x and y :

$3x + 2y = 13$ and $3x = 2 - y$ (4)
[17]

QUESTION 3

Given the linear pattern: $2x + 2$; $3x + 4$; $5x + 6$; ...

3.1 If $x = 0$, calculate the numerical value of the fourth term.

Hence determine the n^{th} term of the sequence. (4)

3.2 Calculate the value of the 18th term. (2)

3.3 Which term in the sequence will be equal to 108? (2)

3.4 Determine the largest value of n for which $T_n < 166$. (3)

3.5 The following values are the multiples of five from the number pattern:
5; 10; 15; 20; ...

Determine the 16th even number of this pattern. (3)

[14]

QUESTION 4

4.1 Sylvia wants to buy a Defy dishwasher which is priced at R9 899 by means of a hire purchase agreement.

The conditions of the hire purchase agreement are as follows:

- Sylvia must pay a 30% deposit of the purchase price
- Interest is charged at 12% per annum simple interest on the balance
- Compulsory monthly insurance premium of R65,30
- The balance must be paid in monthly instalments
- Account should be settled in 36 months

4.1.1 Calculate the balance after Sylvia has paid the deposit. (2)

4.1.2 Calculate her monthly instalment, if the settlement must be settled in 36 months. (5)

4.2 The table below shows the exchange rate of the British pound and the US dollar in South African rand.

COUNTRY	UNIT	EXCHANGE RATE
USA	Dollar (\$)	R16,24
England	Pound (£)	R27,63

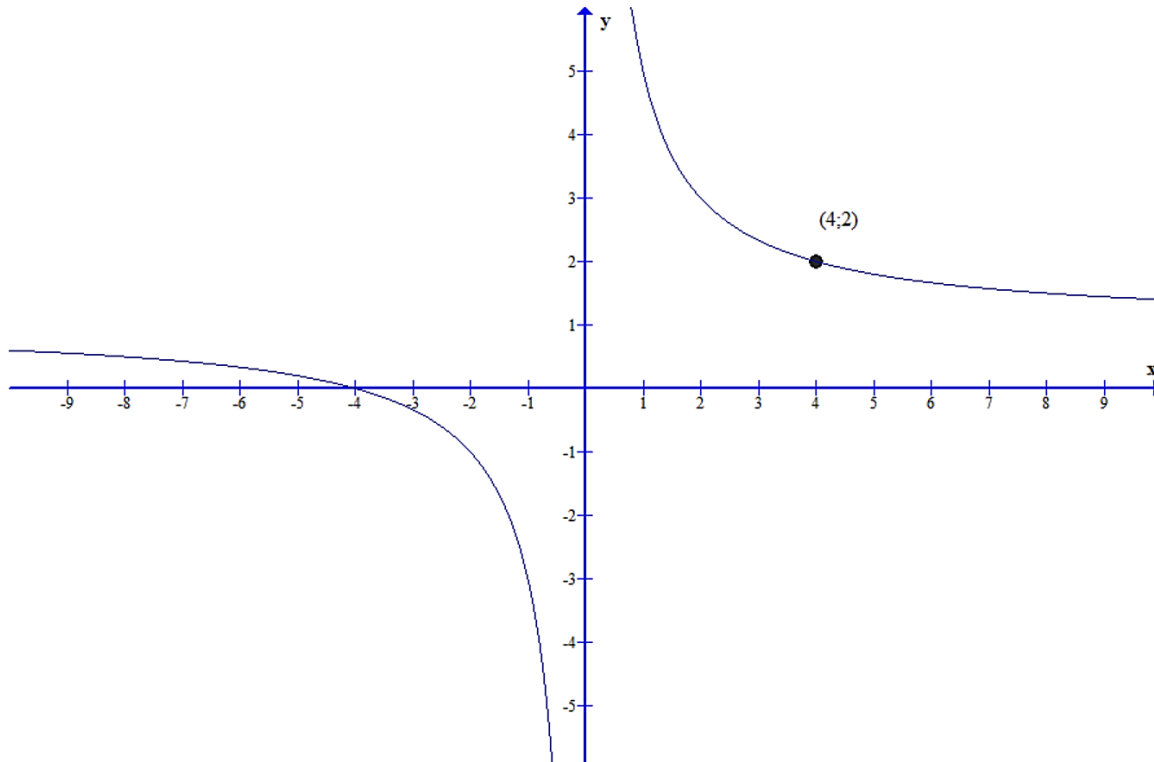
4.2.1 George, a visitor from England, saw an industrial textile machine on sale for \$6 800. This machine is suitable for his business back at home. The cost for a similar machine in England is £4 600. Calculate in which country will it be cost saving for George to buy the machine. (3)

4.2.2 To install an outdoor swimming pool will cost you £800 in England. How much will it cost you to install a swimming pool of the same capacity in South African rand? (2)

[12]

QUESTION 5

The equation of the function $g(x) = \frac{a}{x} + q$ is shown below. It passes through the point $(4; 2)$ on the graph of g and has a range of $y \in (-\infty; 1) \cup (1; \infty)$.



- 5.1 Determine the:
- 5.1.1 Equation of g (3)
- 5.1.2 Equation of h , the axis of symmetry of g which has a positive gradient (2)
- 5.2 Sketch the graph of h on the provided diagram sheet. Clearly show ALL the asymptotes and intercepts with the axes. (4)
- 5.3 Write the equations of the asymptotes of f if $f(x) = -g(x) + 3$. (3)
- 5.4 Use the graphs to determine the value(s) of x for which:
- 5.4.1 $g(x) = h(x)$ (2)
- 5.4.2 $g(x) \leq h(x)$ where $(x < 0)$ (2)
- [16]**

QUESTION 6

Given: $f(x) = 3^x - 1$ and $g(x) = \frac{1}{x+1}$

- 6.1 Sketch the graphs of f and g on the same set of axes, using the provided diagram sheet. Clearly indicate all intercept points with the x -axis and the y -axis as well as any asymptotes. (6)
- 6.2 Using your graph, write down the coordinates of the point of intersection of f and g (where $x > 0$). (2)
- 6.3 What is the range of f ? (1)
- 6.4 Write down the domain of g . (2)
- 6.5 Write down the equation of the asymptotes of g . (2)
- 6.6 Determine the values of x where $g(x) \leq 0$ where $x < -2$ (2)
- [15]**

QUESTION 7

- 7.1 An entire sample space is made up of two complementary events, S and T, where $P(S') = 0,33$.
- 7.1.1 Complete the statement: $P(S) + P(T) = \dots$ (1)
- 7.1.2 Write down the value of $P(T)$. (1)
- 7.2 A survey was conducted among 180 residents of a small town to establish how many people contracted tuberculosis (TB) and/or human immunodeficiency virus (HIV) during the last 5 years. The results were as follows:
- x people were diagnosed with TB
 - 30 people were diagnosed with both TB and HIV
 - 69 people were HIV positive
 - 51 people did not have either disease
- 7.2.1 Represent the information above in a Venn diagram. (4)
- 7.2.2 How many people contracted TB only? (3)
- 7.2.3 Calculate the probability that a person selected at random:
- (a) Will only have been diagnosed with TB (2)
- (b) Will not have any of the two diseases (1)
- [12]**

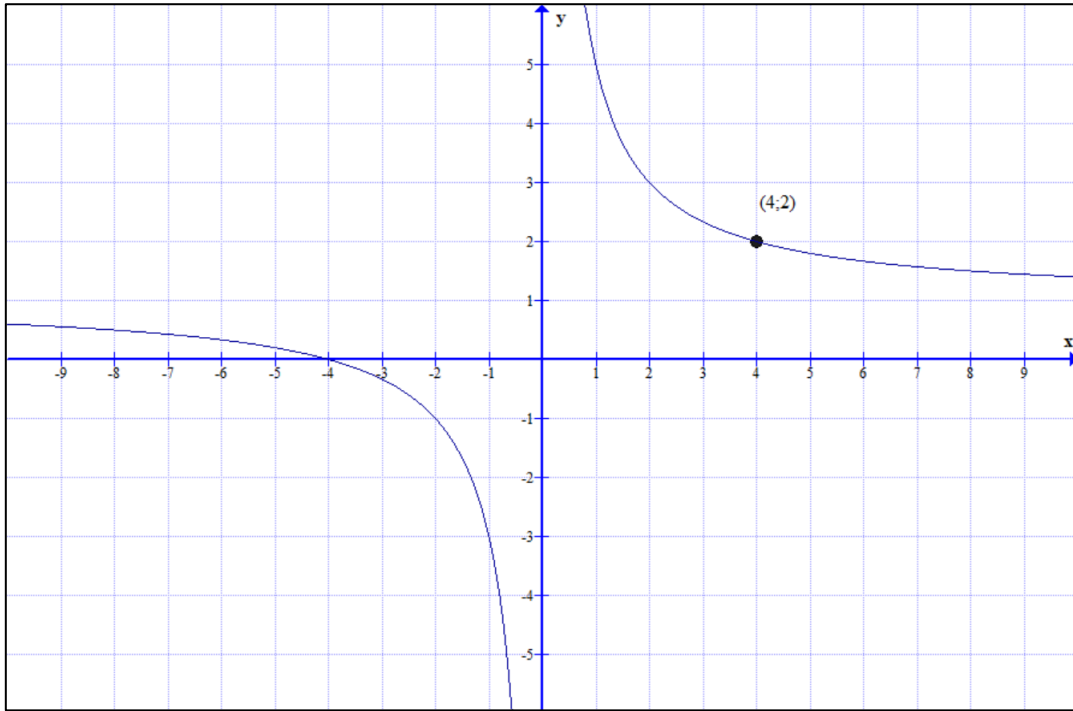
TOTAL: 100

NAME OF LEARNER: _____

CLASS: _____

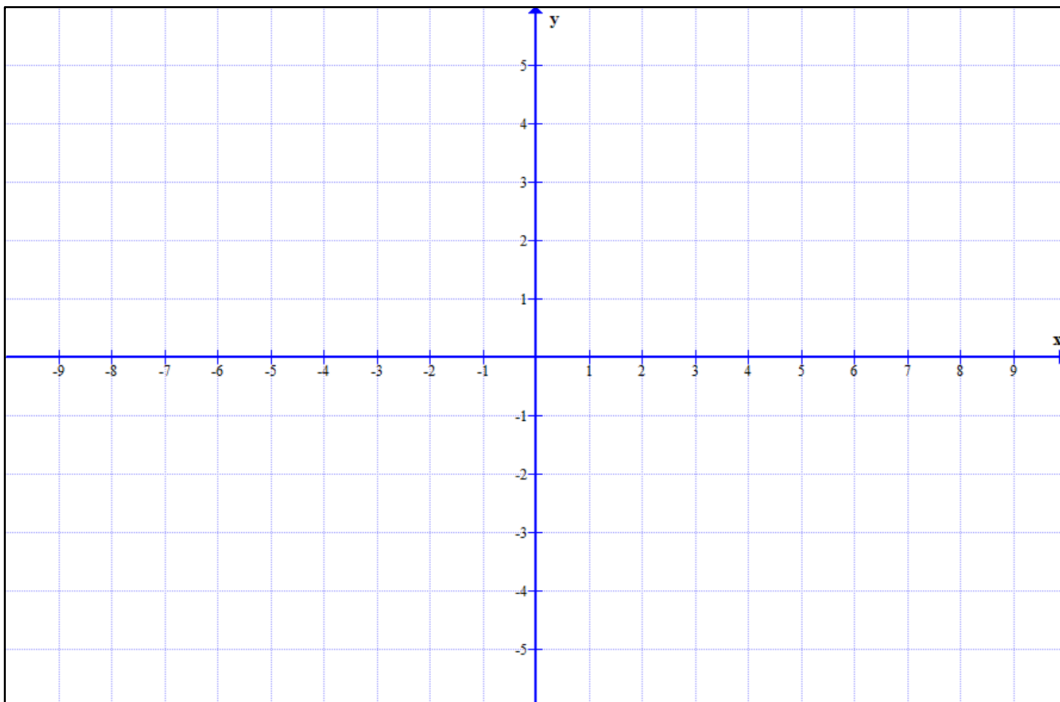
DIAGRAM SHEET

QUESTION 5.2



(4)

QUESTION 6.1



(6)