



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

**MATHEMATICS P1
PAST PAPER QUESTIONS
ORGANISED BY TOPIC**

October 2019 Edition

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All exam questions in this document have been extracted from Department of Education exam papers.

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PROGRESS TRACKER

Equations & Inequalities	Attempts	DBE Nov 18 Q1		DBE Nov 17 Q1		DBE Nov 16 Q1		DBE Nov 16 Q3		DBE Nov 15 Q1		DBE Nov 14 Q1		DBE Nov 14 Q3		DBE Nov 13 Q1	
		[29]	%	[24]	%	[30]	%	[6]	%	[28]	%	[20]	%	[5]	%	[25]	%
	1 st																
	2 nd																
	3 rd																
	Attempts	Exemplar 13 Q1		Exemplar 13 Q2.1 & Q2.3		Exemplar Q3											
		[15]	%	[14]	%	[13]	%										
	1 st																
	2 nd																
	3 rd																

Powers and Roots	Attempts	DBE Nov 18 Q2		DBE Nov 17 Q2		DBE Nov 16 Q2		DBE Nov 15 Q2		DBE Nov 14 Q2		DBE Nov 13 Q2		Exemplar 13 Q2	
		[17]	%	[18]	%	[12]	%	[15]	%	[11]	%	[14]	%	[5]	%
	1 st														
	2 nd														
	3 rd														

Number Patterns	Attempts	DBE Nov 18 Q3		DBE Nov 18 Q4		DBE Nov 17 Q3		DBE Nov 17 Q4		DBE Nov 16 Q3		DBE Nov 16 Q4		DBE Nov 15 Q3		DBE Nov 15 Q4	
		[9]	%	[16]	%	[10]	%	[17]	%	[10]	%	[14]	%	[15]	%	[12]	%
	1 st																
	2 nd																
	3 rd																
	Attempts	DBE Nov 14 Q4		DBE Nov 14 Q5		DBE Nov 13 Q6		DBE Nov 13 Q7		DBE Nov 13 Q8		Exemplar 13 Q6		Exemplar 13 Q7			
		[14]	%	[12]	%	[12]	%	[4]	%	[5]	%	[17]	%	[6]	%		
	1 st																
	2 nd																
	3 rd																

Functions	Attempts	DBE Nov 18 Q5		DBE Nov 18 Q6		DBE Nov 17 Q5		DBE Nov 17 Q6		DBE Nov 16 Q5		DBE Nov 16 Q6		DBE Nov 16 Q7		DBE Nov 16 Q10	
		[21]	%	[23]	%	[21]	%	[22]	%	[17]	%	[19]	%	[9]	%	[4]	%
	1 st																
	2 nd																
	3 rd																
	Attempts	DBE Nov 15 Q5		DBE Nov 15 Q6		DBE Nov 15 Q7		DBE Nov 14 Q6		DBE Nov 14 Q7		DBE Nov 14 Q8		DBE Nov 13 Q9		DBE Nov 13 Q10	
		[25]	%	[15]	%	[7]	%	[10]	%	[12]	%	[21]	%	[22]	%	[12]	%
	1 st																
	2 nd																
	3 rd																
	Attempts	DBE Nov 13 Q11		DBE Nov 13 Q12		Exemplar 13 Q8		Exemplar 13 Q9		Exemplar 13 Q10							
		[4]	%	[8]	%	[19]	%	[20]	%	[4]	%						
	1 st																
	2 nd																
	3 rd																

Finance Growth and Decay	Attempts	DBE Nov 18 Q7		DBE Nov 17 Q7		DBE Nov 16 Q7		DBE Nov 15 Q8		DBE Nov 14 Q9		DBE Nov 13 Q4		DBE Nov 13 Q5		Exemplar 13 Q4	
		[13]	%	[16]	%	[16]	%	[16]	%	[21]	%	[7]	%	[10]	%	[10]	%
	1 st																
	2 nd																
	3 rd																
	Attempts	Exemplar 13 Q5															
		[8]	%														
	1 st																
	2 nd																
	3 rd																

Probability and Venn Diagrams	Attempts	DBE Nov 18 Q8		DBE Nov 18 Q9		DBE Nov 17 Q8		DBE Nov 17 Q9		DBE Nov 16 Q9		DBE Nov 15 Q9		DBE Nov 14 Q10		DBE Nov 14 Q11	
		[9]	%	[13]	%	[11]	%	[11]	%	[18]	%	[17]	%	[12]	%	[4]	%
	1 st																
	2 nd																
	3 rd																
	Attempts	DBE Nov 14 Q12		DBE Nov 13 Q13		DBE Nov 13 Q14		DBE Nov 13 Q15		Exemplar 13 Q11		Exemplar 13 Q12					
		[8]	%	[10]	%	[7]	%	[4]	%	[5]	%	[14]	%				
	1 st																
	2 nd																
	3 rd																

QUESTION 1

1.1 Solve for x in each of the following:

1.1.1 $x(2x+1)=0$ (2)

1.1.2 $5x^2 + 2x - 6 = 0$ (correct to TWO decimal places) (3)

1.1.3 $2x^2 - 2 \geq 3x$ (4)

1.1.4 $\sqrt{2x+5} - \frac{3}{\sqrt{2x+5}} = -2$ (6)

1.2 Solve for x and y simultaneously:

$y + x = 2$ and $x^2 + 3xy + 8 = 0$ (6)

1.3 The roots of the equation $f(x) = 0$ are $x = \frac{4 \pm \sqrt{16 - 4m(-m+5)}}{2m}$

Determine the values of m for which the roots will be non-real. (4)

1.4 Show that the maximum value of $\sqrt{-x^2 + 4x + 12}$ is 4. (4)

[29]**QUESTION 1**

1.1 Solve for x :

1.1.1 $(2x-3)(x+7)=0$ (2)

1.1.2 $7x^2 + 3x - 2 = 0$ (leave your answer correct to TWO decimal places) (3)

1.1.3 $\sqrt{x-1} + 3 = x$ (6)

1.1.4 $x^2 > 3(x+6)$ (4)

1.2 Solve for x and y simultaneously:

$$2y + x = 1$$

$$x^2 + y^2 + 3xy + y = 0$$
 (6)

1.3 If $f(x) = 0$ has roots $x = \frac{-5 \pm \sqrt{3-12k^2}}{4}$, for which values of k will the roots be equal? (3)

[24]

QUESTION 1

1.1 Solve for x in each of the following:

1.1.1 $3x^2 - 5x - 1 = 0$ (leave your answer correct to TWO decimal places) (3)

1.1.2 $x^2 - 6x + 8 = 0$ (3)

1.1.3 $4x - 2x^2 < 0$ (4)

1.1.4 $2^{3x+1} + 2^{3x} = 12$ (4)

1.1.5 $\sqrt{x-1} + 3 = x - 4$ (6)

1.2 Solve for x and y simultaneously:

$3x - y + 2 = 0$ and $y = -x^2 + 2x + 8$ (6)

1.3 Show that the roots of $3x^2 + (k+2)x = 1 - k$ are real and rational for all values of k . (4)
[30]

QUESTION 3

The hypotenuse of a right-angled triangle is 25 cm and the length of one other side is x cm. The perimeter of the triangle is 60 cm.

3.1 Show that the third side of the triangle is $(35 - x)$ cm. (1)

3.2 Calculate the lengths of the two shorter sides of the triangle. (5)
[6]

QUESTION 1

1.1 Solve for x in each of the following:

1.1.1 $x^2 + x - 12 = 0$ (3)

1.1.2 $\sqrt{2x+1} = x-1$ (5)

1.1.3 $2^{x\sqrt{x}} = 2^{27}$ (4)

1.1.4 $x^2 - 2x - 8 < 0$ (3)

1.2 Given: $f(x) = 5x^2 + 6x - 7$

1.2.1 Solve for x if $f(x) = 0$ (correct to TWO decimal places). (4)

1.2.2 Hence, or otherwise, calculate the value of d for which $5x^2 + 6x - d = 0$ has equal roots. (3)

1.3 Solve for x and y simultaneously:

$x - 2y = -3$ and $xy = 20$ (6)
[28]

QUESTION 1

1.1 Solve for x :

1.1.1 $(x+2)(3x-7) = 0$ (2)

1.1.2 $x^2 - 5x = 2$ (Correct to TWO decimal places) (4)

1.1.3 $\sqrt{x-3} - 4 = 5$ (4)

1.1.4 $2x^2 - 7x - 4 \geq 0$ (4)

1.2 Solve the following equations simultaneously:

$x = 2y + 1$

$x^2 - 2y + 3xy = 6$ (6)
[20]

A rectangle ABCD is shown with a vertical line segment BE. The height AF is labeled $(x-2)$.

QUESTION 1 DBE NOV 13 Q1

$$\begin{aligned} y &= x + 2 \\ xy + y^2 - 10(x + 1) &= 0 \end{aligned} \tag{6}$$

QUESTION 11.1 Solve for x :

1.1.1 $(2x - 1)(x + 5) = 0$ (2)

1.1.2 $2x^2 - 4x + 1 = 0$ (Leave your answer in simplest surd form.) (3)

1.2 Simplify, without the use of a calculator, the following expressions fully:

1.2.1 $125^{\frac{2}{3}}$ (2)

1.2.2 $(3\sqrt{2} - 12)(2\sqrt{2} + 1)$ (3)

1.3 Given: $\frac{x^2 - x - 6}{3x - 9}$

1.3.1 For which value(s) of x will the expression be undefined? (2)1.3.2 Simplify the expression fully. (3)
[15]**QUESTION 2**

2.1 Given: $(x + 2)(x - 3) < -3x + 2$

2.1.1 Solve for x if: $(x + 2)(x - 3) < -3x + 2$ (4)

2.1.2 Hence or otherwise, determine the sum of all the integers satisfying the expression $x^2 + 2x - 8 < 0$. (3)2.3 Solve for x and y from the given equations:

$3^y = 81^x$ and $y = x^2 - 6x + 9$ (7)

[14]

QUESTION 3

3.1 The solution to a quadratic equation is $x = \frac{3 \pm \sqrt{4 - 8p}}{4}$ where $p \in \mathbf{Q}$.

Determine the value(s) of p such that:

3.1.1 The roots of the equation are equal (2)

3.1.2 The roots of the equation are non-real (2)

3.2 Given: $\sqrt{5 - x} = x + 1$

3.2.1 Without solving the equation, show that the solution to the above equation lies in the interval $-1 \leq x \leq 5$. (3)

3.2.2 Solve the equation. (5)

3.2.3 Without any further calculations, solve the equation $-\sqrt{5 - x} = x + 1$. (1)
[13]

POWERS AND ROOTS

DBE NOV 18 Q2

QUESTION 2

- 2.1 Simplify fully, WITHOUT using a calculator: $\frac{2^{x-3} - 3 \cdot 2^{x+1}}{2^{x-2}}$ (4)
- 2.2 Solve for x :
- 2.2.1 $2 - 16x^{-\frac{3}{2}} = 0$ (3)
- 2.2.2 $4^x + 8 = 9 \cdot 2^x$ (4)
- 2.2.3 $\sqrt[3]{9} = 243$ (3)
- 2.3 Simplify fully:
- $$\frac{\sqrt{p^2 - q^2} \times (p + q)^{\frac{5}{2}}}{(p - q)^{\frac{1}{2}}} \text{ if } p \neq q$$
- (3)
[17]

DBE NOV 17 Q2

QUESTION 2

- 2.1 Simplify fully, WITHOUT using a calculator:
- $$\frac{3^{m+4} - 6 \cdot 3^{m+1}}{7 \cdot 3^{m+2}}$$
- (4)
- 2.2 Solve for x , WITHOUT using a calculator:
- 2.2.1 $x^{-\frac{3}{4}} = 8$ (3)
- 2.2.2 $4^x - 2^x = 2$ (4)
- 2.3 If $x = \frac{3 - \sqrt{a}}{\sqrt{2}}$ and $y = \frac{4 + \sqrt{a}}{\sqrt{2}}$, determine the value of $(x + y)^2$ (3)
- 2.4 Show, WITHOUT using a calculator, that $\sqrt[12]{10} \times \sqrt[6]{640} \times \sqrt[4]{810} \times \sqrt{40} = 120$ (4)
[18]

QUESTION 2

2.1 Simplify fully, WITHOUT using a calculator:

$$2.1.1 \quad \frac{5^{a-2} \cdot 2^{a+2}}{10^a - 10^{a-1} \cdot 2} \quad (5)$$

$$2.1.2 \quad \frac{\sqrt{27m^6} - \sqrt{48m^6}}{\sqrt{12m^6}} \quad (3)$$

2.2 WITHOUT using a calculator, show that $\frac{2}{1+\sqrt{2}} - \frac{8}{\sqrt{8}} = -2$ (4)

[12]

QUESTION 2

2.1 Simplify, without using a calculator:

$$2.1.1 \quad \frac{2^{n+2} \cdot 4^{n+1}}{8^{n-1}} \quad (3)$$

$$2.1.2 \quad \sqrt{x + \sqrt{2x-1}} \cdot \sqrt{x - \sqrt{2x-1}} \quad (4)$$

2.2 Given: $P = \sqrt{\frac{5}{x+2}} + \frac{x}{3}$

2.2.1 For what value(s) of x will P be a real number? (2)

2.2.2 Show that P is rational if $x = 3$. (2)

2.3 Calculate the sum of the digits of $2^{2015} \times 5^{2019}$. (4)

[15]

QUESTION 2

2.1 Simplify the following fully: $\frac{3^{x+1} - 3^{x-1}}{2 \cdot 3^x}$ (3)

2.2 Solve for x : $\sqrt{(x-2)^{-3}} = 64$ (4)

2.3 Rewrite the following expression as a power of x : $\frac{x\sqrt{x\sqrt{x\sqrt{x}}}}{\sqrt[8]{x^7}}$ (4)

[11]

QUESTION 2

2.1 Given: $\sqrt{x+6} = x+4$

2.1.1 Calculate x in the given equation. (5)

2.1.2 Hence, or otherwise, write down the solution to $\sqrt{x+5} = x+3$. (2)

2.2 Given: $f(x) = \frac{3}{\sqrt{3^x - 9}}$

2.2.1 Determine $f(3)$. Leave your answer in simplest surd form. (3)

2.2.2 For which value(s) of x is $f(x)$ undefined? (3)

2.2.3 For which value(s) of x is $f(x)$ non-real? (1)
[14]

DBE EXEMPLAR 13 Q2**QUESTION 2**

2.2 Given: $\frac{4^{x-1} + 4^{x+1}}{17 \cdot 12^x}$

2.2.1 Simplify the expression fully. (4)

2.2.2 If $3^{-x} = 4t$, express $\frac{4^{x-1} + 4^{x+1}}{17 \cdot 12^x}$ in terms of t . (1)

[5]

NUMBER PATTERNS

DBE NOV 18 Q3

QUESTION 3

- 3.1 Given the linear pattern: $7 ; 2 ; -3 ; \dots$
- 3.1.1 Determine the general term, T_n , of the linear pattern. (2)
- 3.1.2 Calculate the value of T_{20} . (2)
- 3.1.3 Which term in the pattern has a value of -138 ? (2)
- 3.2 $6 ; 2x + 1$ and $3x - 3$ are the first three terms of a linear pattern.
- Calculate the value of x . (3)
- [9]

DBE NOV 18 Q4

QUESTION 4

The quadratic number pattern: $4 ; p ; 11 ; q ; 22 ; \dots$ has a constant second difference of 1.

- 4.1 Show that $p = 7$ and $q = 16$. (3)
- 4.2 Determine the general term, T_n , of the quadratic pattern. (4)
- 4.3 Determine the value of n if $T_n = 232$. (4)
- 4.4 If the sum of two consecutive terms in the pattern is 1 227, calculate the difference between these two terms. (5)
- [16]

DBE NOV 17 Q3

QUESTION 3

- 3.1 Given the finite linear pattern: $12 ; 17 ; 22 ; \dots ; 172$
- 3.1.1 Determine a formula for the n^{th} term of the pattern. (2)
- 3.1.2 Calculate the value of T_{12} . (2)
- 3.1.3 Determine the number of terms in the pattern. (2)
- 3.2 Given the first four terms of a linear pattern: $3 ; x ; y ; 30$
- Calculate the values of x and y . (4)
- [10]

QUESTION 4

Given the quadratic pattern: 244 ; 193 ; 148 ; 109 ...

- 4.1 Write down the next term of the pattern. (2)
 - 4.2 Determine a formula for the n^{th} term of the pattern. (4)
 - 4.3 Which term of the pattern will have a value of 508? (4)
 - 4.4 Between which TWO consecutive terms of the quadratic pattern will the first difference be 453? (3)
 - 4.5 Show that all the terms of the quadratic pattern are positive. (4)
- [17]**

QUESTION 3

Consider the quadratic pattern: $-9; -6; 1; 12; x; \dots$

- 3.1 Determine the value of x . (1)
 - 3.2 Determine a formula for the n^{th} term of the pattern. (4)
 - 3.3 A new pattern, P_n , is formed by adding 3 to each term in the given quadratic pattern. Write down the general term of P_n in the form $P_n = an^2 + bn + c$. (1)
 - 3.4 Which term of the sequence found in QUESTION 3.3 has a value of 400? (4)
- [10]**

QUESTION 4

- 4.1 Given the linear pattern: 18 ; 14 ; 10 ; ...
- 4.1.1 Write down the fourth term. (1)
- 4.1.2 Determine a formula for the general term of the pattern. (2)
- 4.1.3 Which term of the pattern will have a value of -70 ? (2)
- 4.1.4 If this linear pattern forms the first differences of a quadratic pattern, Q_n , determine the first difference between Q_{509} and Q_{510} . (2)
- 4.2 A quadratic pattern has a constant second difference of 2 and $T_5 = T_{17} = 29$.
- 4.2.1 Does this pattern have a minimum or maximum value? Justify the answer. (3)
- 4.2.2 Determine an expression for the n^{th} term in the form $T_n = an^2 + bn + c$. (5)
- [15]**

QUESTION 3

- 3.1 Given the linear pattern: 5 ; -2 ; -9 ; ... ; -289
- 3.1.1 Write down the constant first difference. (1)
- 3.1.2 Write down the value of T_4 . (1)
- 3.1.3 Calculate the number of terms in the pattern. (3)
- 3.2 A linear pattern has a difference of 3 between consecutive terms and its 20th term is equal to 64 (that is $T_{20} = 64$).
- 3.2.1 Determine the value of T_{22} . (1)
- 3.2.2 Which term in the pattern will be equal to $3T_5 - 2$? (4)
- 3.3 Consider the quadratic pattern: 5 ; 12 ; 29 ; 56 ; ...
- 3.3.1 Write down the NEXT TWO terms of the pattern. (2)
- 3.3.2 Prove that the first differences of this pattern will always be odd. (3)
- [15]**

QUESTION 4

4.1 Consider the quadratic pattern: 3 ; 5 ; 8 ; 12 ; ...

Determine the value of T_{26} . (6)

4.2 A certain quadratic pattern has the following characteristics:

- $T_1 = p$
- $T_2 = 18$
- $T_4 = 4T_1$
- $T_3 - T_2 = 10$

Determine the value of p . (6)
[12]

QUESTION 4

Consider the following quadratic number pattern: -7 ; 0 ; 9 ; 20 ; ...

4.1 Show that the general term of the quadratic number pattern is given by
 $T_n = n^2 + 4n - 12$. (4)

4.2 Which term of the quadratic pattern is equal to 128? (4)

4.3 Determine the general term of the first differences. (3)

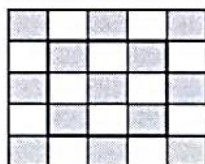
4.4 Between which TWO terms of the quadratic pattern will the first difference be 599? (3)
[14]

QUESTION 5

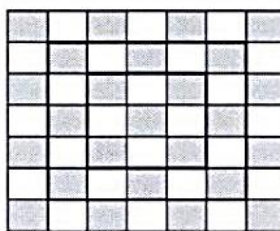
Grey and white squares are arranged into patterns as indicated below.



Pattern 1



Pattern 2



Pattern 3

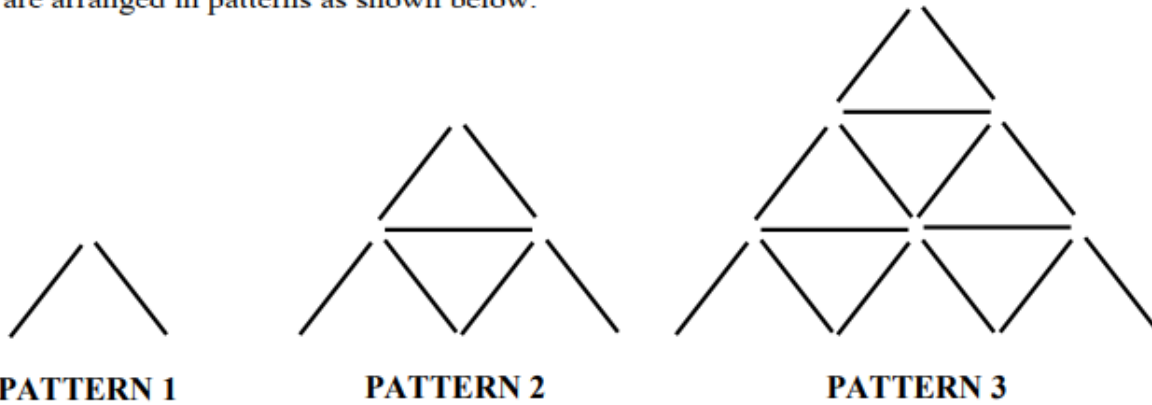
	Pattern 1	Pattern 2	Pattern 3
Number of grey squares	5	13	25

The number of grey squares in the n^{th} pattern is given by $T_n = 2n^2 + 2n + 1$.

- 5.1 How many white squares will be in the FOURTH pattern? (2)
 - 5.2 Determine the number of white squares in the 157^{th} pattern. (3)
 - 5.3 Calculate the largest value of n for which the pattern will have less than 613 grey squares. (4)
 - 5.4 Show that the TOTAL number of squares in the n^{th} pattern is always an odd number. (3)
- [12]**

QUESTION 6

Sticks are arranged in patterns as shown below.



Pattern number	1	2	3
Number of sticks	2	7	15

- 6.1 Write down the number of sticks needed to build Pattern 4 if the patterns are consistent. (1)
- 6.2 Determine a formula to calculate the number of sticks needed to build Pattern n . (4)
- 6.3 How many sticks would you need to build Pattern 16? (2)
- 6.4 Calculate the maximum value of n if you have only 126 sticks available to build Pattern n . (5)
- [12]**

QUESTION 7

Given the number pattern: $\frac{1}{2}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{4}{5}$; y ; ...

- 7.1 Given that the pattern behaves consistently, write down the value of y . (1)
- 7.2 Determine a formula for T_n , the n^{th} term of this pattern. (3)
- [4]**

QUESTION 8

Two number patterns, the one consisting of uneven numbers and the other consisting of even numbers, are combined to form a new number pattern as shown below.

1 ; 2 ; 5 ; 6 ; 9 ; 18 ; 13 ; 54 ; ...

- 8.1 Write down the next TWO terms of the pattern. (2)
- 8.2 Calculate the 31st term of the pattern. (3)
- [5]**

DBE EXEMPLAR 13 Q6

QUESTION 6

- 6.1 Given: $\frac{1}{2} ; \frac{1}{4} ; \frac{1}{8} ; \dots ; \frac{1}{1024}$
- 6.1.1 Explain how you will determine the 4th term of the sequence. (2)
- 6.1.2 Write a formula for the n^{th} term of the sequence. (2)
- 6.1.3 Determine the number of terms in the sequence. (2)
- 6.2 Given the linear pattern: 156 ; 148 ; 140 ; 132 ; ...
- 6.2.1 Write down the 5th term of this number pattern. (1)
- 6.2.2 Determine a general formula for the n^{th} term of this pattern. (2)
- 6.2.3 Which term of this linear number pattern is the first term to be negative? (3)
- 6.2.4 The given linear number pattern forms the sequence of first differences of a quadratic number pattern $T_n = an^2 + bn + c$ with $T_5 = -24$.
Determine a general formula for T_n . (5)
- [17]**

DBE EXEMPLAR 13 Q7

QUESTION 7

A given quadratic pattern $T_n = an^2 + bn + c$ has $T_2 = T_4 = 0$ and a second difference of 12.
Determine the value of the 3rd term of the pattern. (6)

QUESTION 5

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

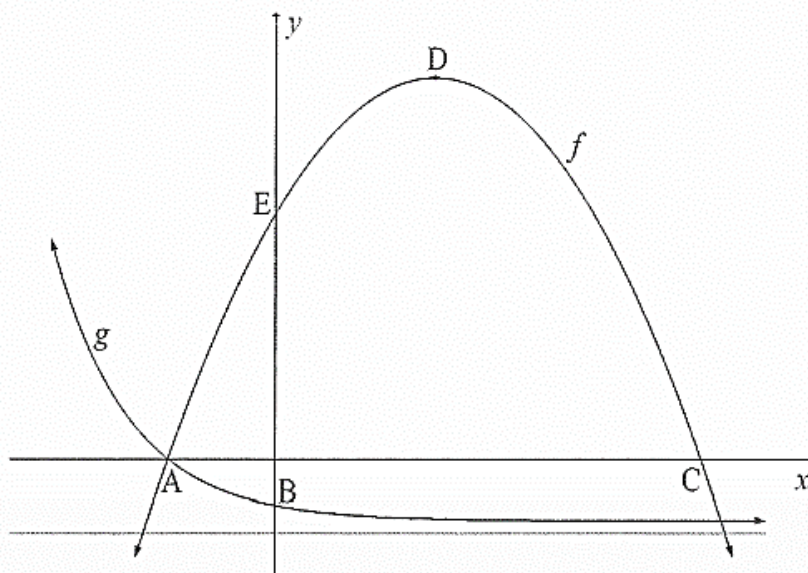
- 5.1 Write down the equations of the asymptotes of f . (2)
- 5.2 Determine the x -intercept of f . (3)
- 5.3 Determine the y -intercept of f . (2)
- 5.4 Sketch the graphs of f and g on the same system of axes. Show clearly ALL the intercepts with the axes and any asymptotes. (5)
- 5.5 Calculate the x -coordinates of the points of intersection of f and g . (4)
- 5.6 If $x < 3$, determine the values of x for which $\frac{4}{x-3} + 2 < x + 2$. (2)
- 5.7 The line $y = x - 1$ cuts f at $P(1 ; 0)$ and Q . Write down the coordinates of Q . (3)
- [21]**

QUESTION 6

The diagram below shows the graphs of $f(x) = -(x-3)^2 + 25$ and $g(x) = 2\left(\frac{1}{2}\right)^{x+1} - 4$.

Graph f cuts the x -axis at A and C, the y -axis at E and has a turning point at D.

Graph g cuts the x -axis at A and the y -axis at B.



- 6.1 Write down the equation of the asymptote of g . (1)
- 6.2 Write down the coordinates of D. (2)
- 6.3 Write down the range of f . (1)
- 6.4 Calculate the length of EB. (4)
- 6.5 Determine the values of x for which f is decreasing. (2)
- 6.6 Calculate the average gradient between points A and B. (5)
- 6.7 Graph t is obtained by reflecting g about the x -axis. Write down the range of t . (2)
- 6.8 If $p(x) = f(x) + 2$, write down the coordinates of the turning point of p . (2)
- 6.9 Determine the value of k for which the straight line $y = 2x + k$ will be a tangent to f . (4)

[23]

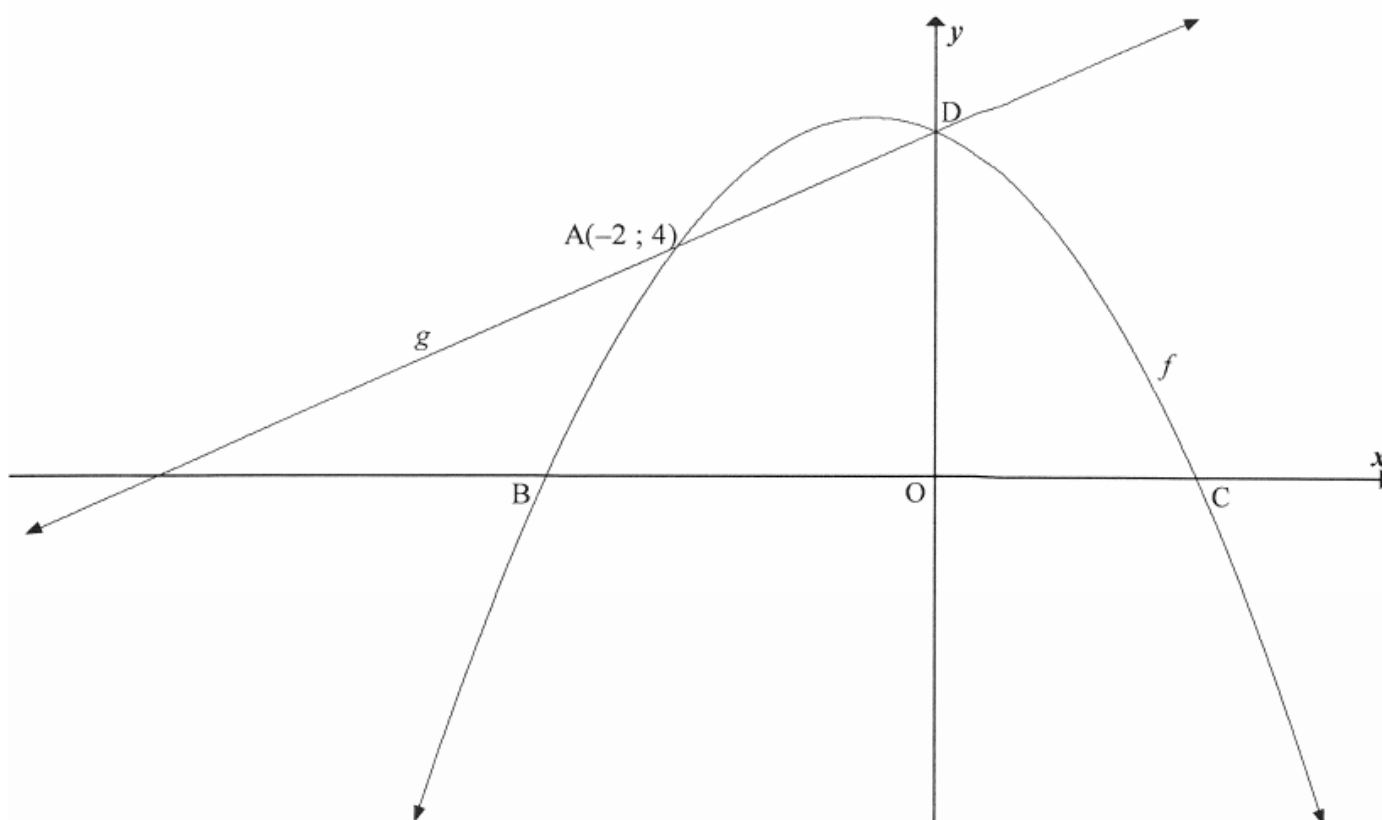
QUESTION 5

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

- 5.1 Determine $f(-3)$. (1)
- 5.2 Determine x if $g(x) = 4$. (2)
- 5.3 Write down the asymptotes of f . (2)
- 5.4 Write down the range of g . (1)
- 5.5 Determine the coordinates of the x - and y - intercepts of f . (5)
- 5.6 Determine the equation of the axis of symmetry of f which has a negative gradient. Leave your answer in the form $y = mx + c$. (2)
- 5.7 Sketch the graphs of f and g on the same system of axes. Clearly show ALL intercepts with the axes and any asymptotes. (6)
- 5.8 If it is given that $f(-1) = g(-1)$, determine the values of x for which $g(x) \geq f(x)$. (2)
- [21]**

QUESTION 6

The diagram below shows the graphs of $f(x) = -x^2 - x + 6$ and $g(x) = mx + c$. $A(-2 ; 4)$ is the point of intersection of the graphs.



- 6.1 Determine the x -intercepts of f . (4)
 - 6.2 Write down the equation of the axis of symmetry of f . (2)
 - 6.3 Determine the range of f . (3)
 - 6.4 Write down the equation of g in the form $g(x) = mx + c$. (3)
 - 6.5 Write down the average gradient between points A and D . (1)
 - 6.6 Determine the equation of h , if h is the reflection of f about the x -axis and then translated 3 units to the right. Leave your answer in the form $h(x) = a(x + p)^2 + q$. (3)
 - 6.7 Write down the values of x for which $f(x) > 0$. (2)
 - 6.8 If $f(p) = f(r) = 4$, calculate the value of $p - r$ if $r < 0$. (4)
- [22]**

QUESTION 5

Given: $f(x) = -2x^2 + x + 6$

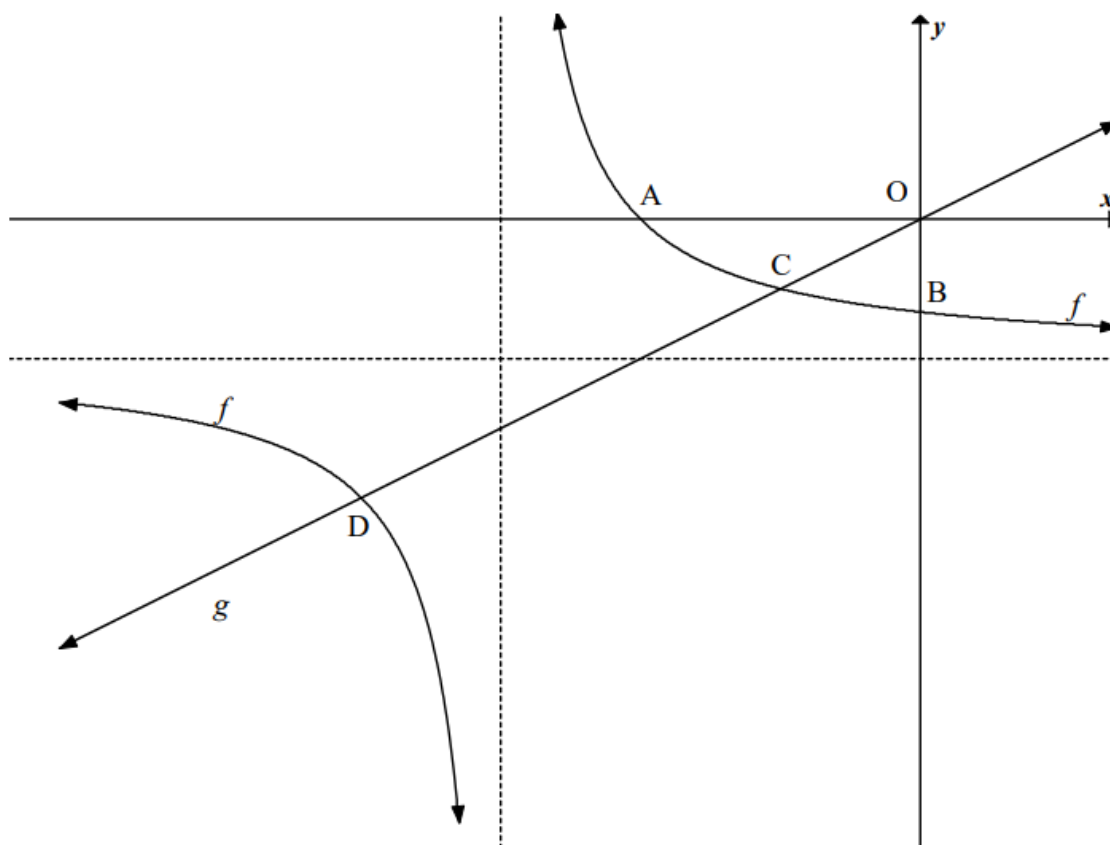
- 5.1 Calculate the coordinates of the turning point of f . (4)
- 5.2 Determine the y -intercept of f . (1)
- 5.3 Determine the x -intercepts of f . (4)
- 5.4 Sketch the graph of f showing clearly all intercepts with the axes and turning point. (3)
- 5.5 Determine the values of k such that $f(x) = k$ has equal roots. (2)
- 5.6 If the graph of f is shifted two units to the right and one unit upwards to form h , determine the equation h in the form $y = a(x + p)^2 + q$. (3)
- [17]**

QUESTION 6

The diagram below shows the graph of $f(x) = \frac{1}{x+3} - 1$ and $g(x) = \frac{1}{2}x$.

The graph of f intersects the x -axis at A and the y -axis at B.

The graph of f and g intersect at points C and D.



6.1 Write down the equations of the asymptotes of f . (2)

6.2 Determine the domain of f . (2)

6.3 Calculate the length of:

6.3.1 OB (2)

6.3.2 OA (3)

6.4 Determine the coordinates of C and D. (6)

6.5 Use the graphs to obtain the solution to: $\frac{1}{x+3} \geq \frac{x+2}{2}$ (4)

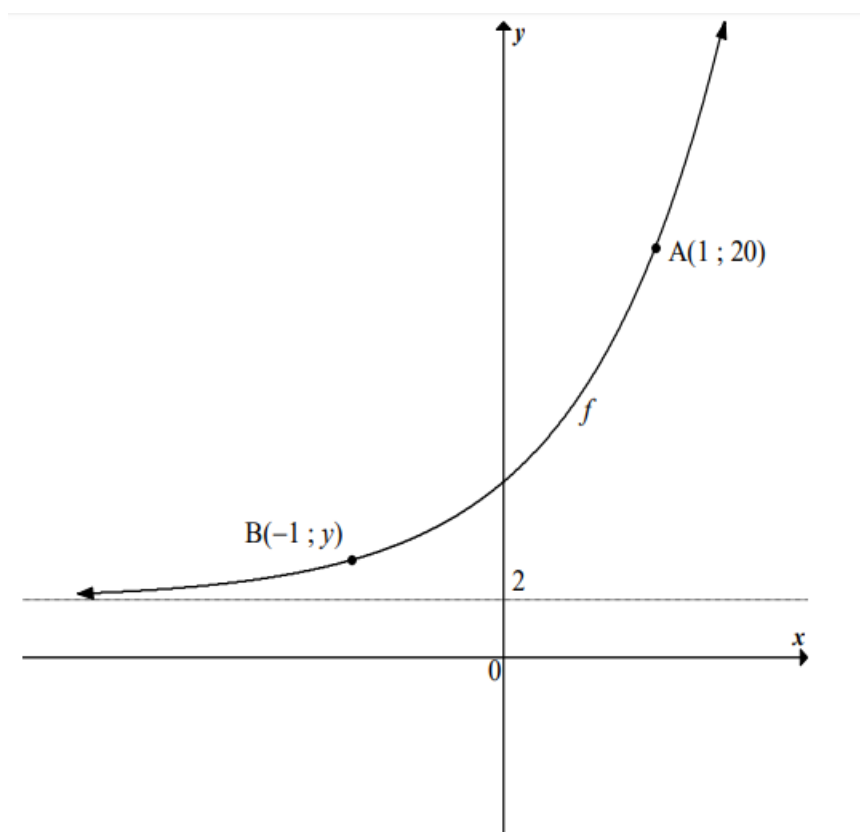
[19]

QUESTION 7

The sketch below is the graph of $f(x) = 2b^{x+1} + q$.

The graph of f passes through the points $A(1; 20)$ and $B(-1; y)$.

The line $y = 2$ is an asymptote of f .



- 7.1 Show that the equation of f is $f(x) = 2(3)^{x+1} + 2$ (3)
- 7.2 Calculate the y -coordinate of the point B . (1)
- 7.3 Determine the average gradient of the curve between the points A and B . (2)
- 7.4 A new function h is obtained when f is reflected about its asymptote. Determine the equation of h . (2)
- 7.5 Write down the range of h . (1)
- [9]**

QUESTION 10

Bongani wants to start a small vegetable garden at his house. He wants to use an existing wall and 14 m of fencing to enclose a rectangular area for the garden. Calculate the dimensions of the largest rectangular area that he can enclose.

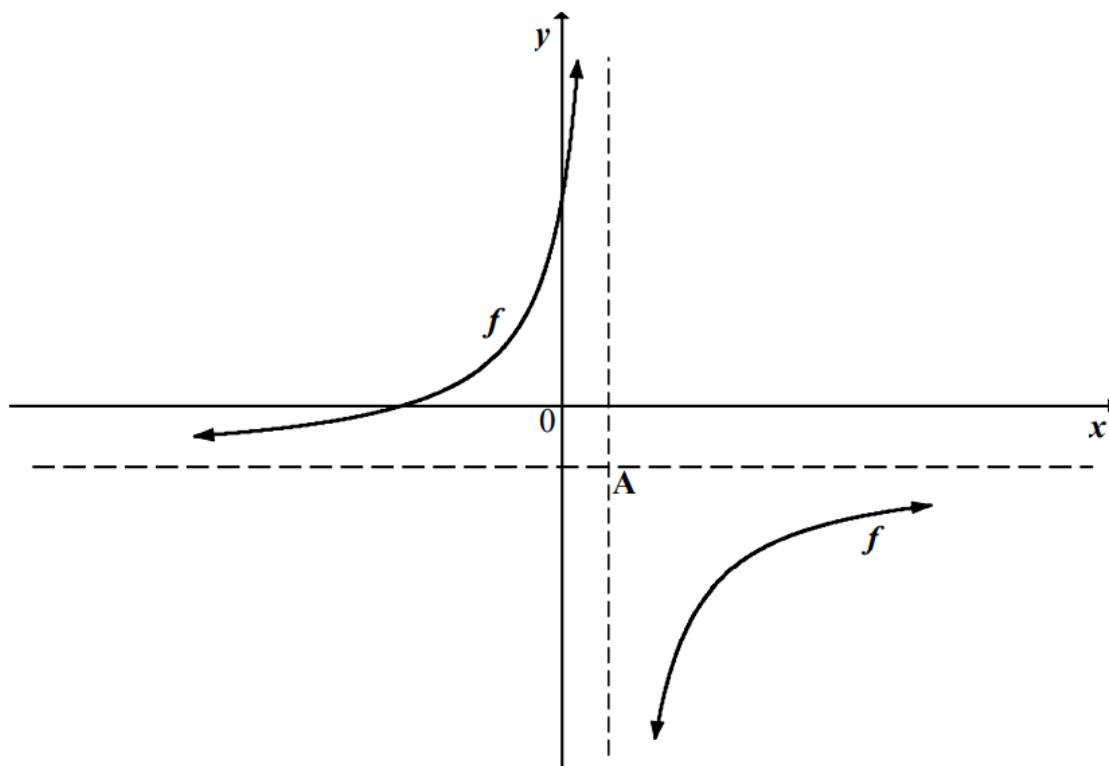
[4]

¹ This is not a typical question from the *Functions* topic. But one can use techniques learnt in Grade 11 to solve this problem. Hint: use your understanding of quadratic functions and their turning points to help solve this.

QUESTION 5

5.1 The sketch below shows the graph of $f(x) = \frac{-9}{x-1} - 2$.

A is the point of intersection of the asymptotes of f .



5.1.1 Write down the coordinates of A. (2)

5.1.2 Determine the coordinates of the x - and y -intercepts of f . (5)

5.1.3 Write down an equation of the axis of symmetry of f that has a negative gradient. (2)

5.1.4 Hence, or otherwise, determine the coordinates of a point that lies on f in the fourth quadrant, which is the closest to point A. (5)

5.1.5 The graph of f is reflected about the x -axis to obtain the graph of g . Write down the equation of g in the form $y = \dots$ (2)

5.2 Given: $h(x) = 4(2^{-x}) + 1$

5.2.1 Determine the coordinates of the y -intercept of h . (2)

5.2.2 Explain why h does not have an x -intercept. (2)

5.2.3 Draw a sketch graph of h , clearly showing all asymptotes, intercepts with the axes and at least one other point on h . (3)

5.2.4 Describe the transformation from h to g if $g(x) = 4(2^{-x} + 2)$. (2)

[25]

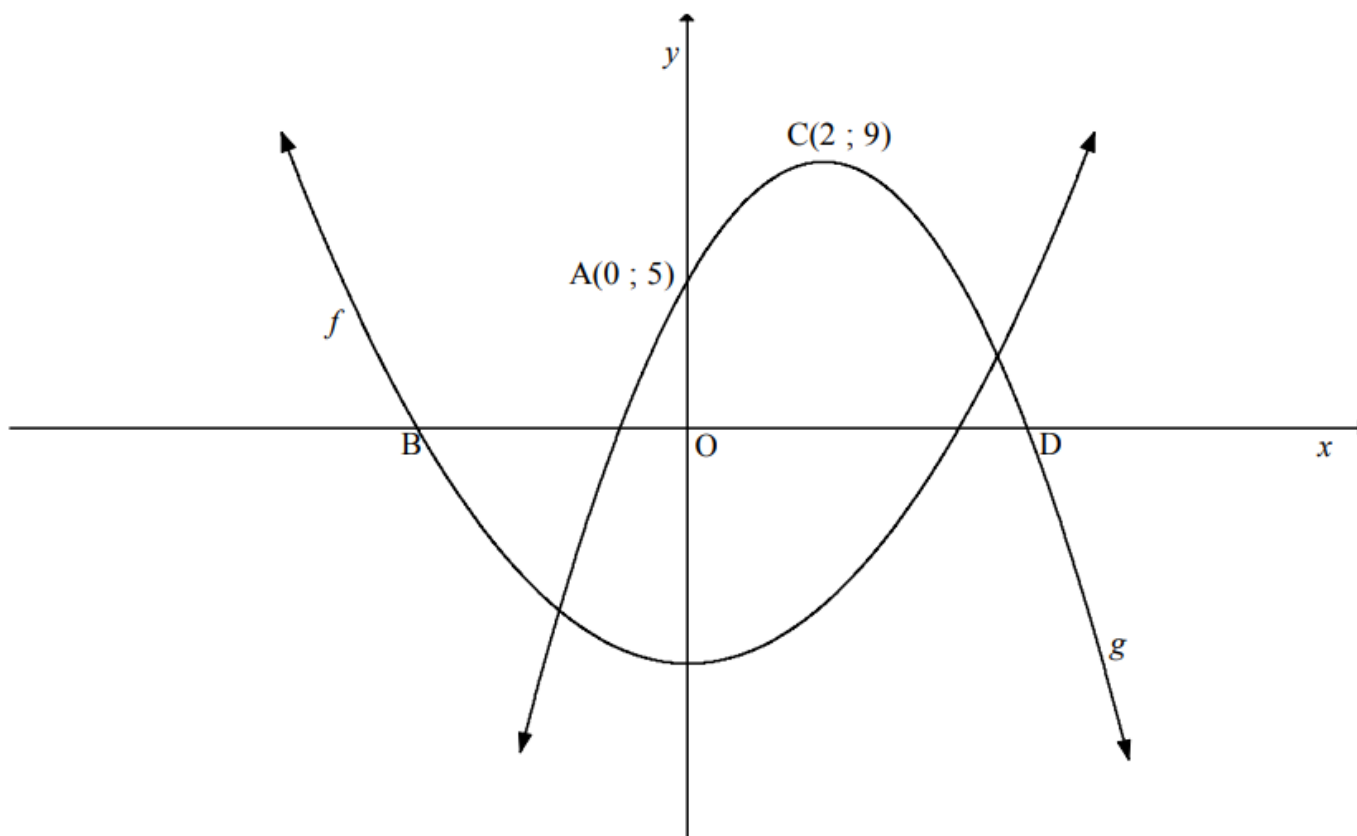
QUESTION 6

The sketch below represents the graphs of two parabolas, f and g .

$$f(x) = \frac{1}{2}x^2 - 8$$

The turning point of g is $C(2; 9)$ and the y -intercept of g is $A(0; 5)$.

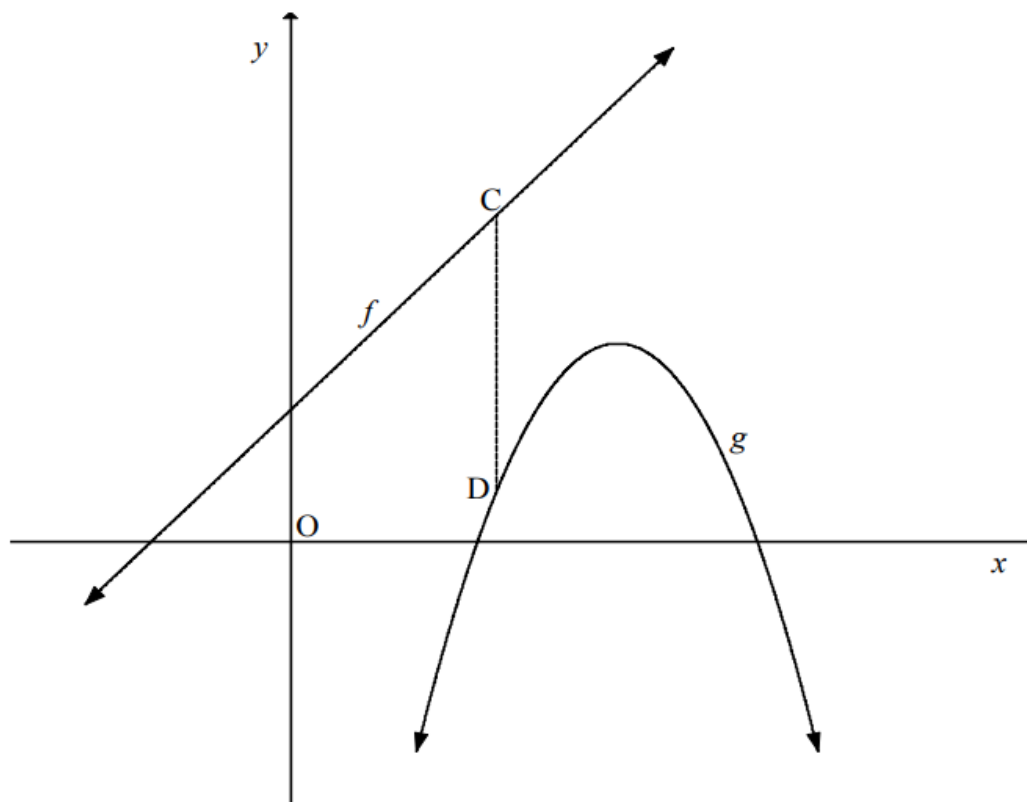
B and D are the x -intercepts of f and g respectively.



- 6.1 Show that $g(x) = -x^2 + 4x + 5$. (4)
- 6.2 Calculate the average gradient of g between A and C . (2)
- 6.3 Calculate the length of BD . (5)
- 6.4 Use the graphs to solve for x , if:
- 6.4.1 $f(x) \geq 0$ (2)
- 6.4.2 f and g are both strictly increasing (2)
- [15]**

QUESTION 7

The sketch below shows the graphs of $f(x) = 2x + 3$ and $g(x) = -2x^2 + 14x + k$.
 C is any point on f and D any point on g , such that CD is parallel to the y -axis.
 k is a value such that C lies above D .



- 7.1 Write down a simplified expression for the length of CD in terms of x and k . (3)
- 7.2 If the minimum length of CD is 5, calculate the value of k . (4)
- [7]**

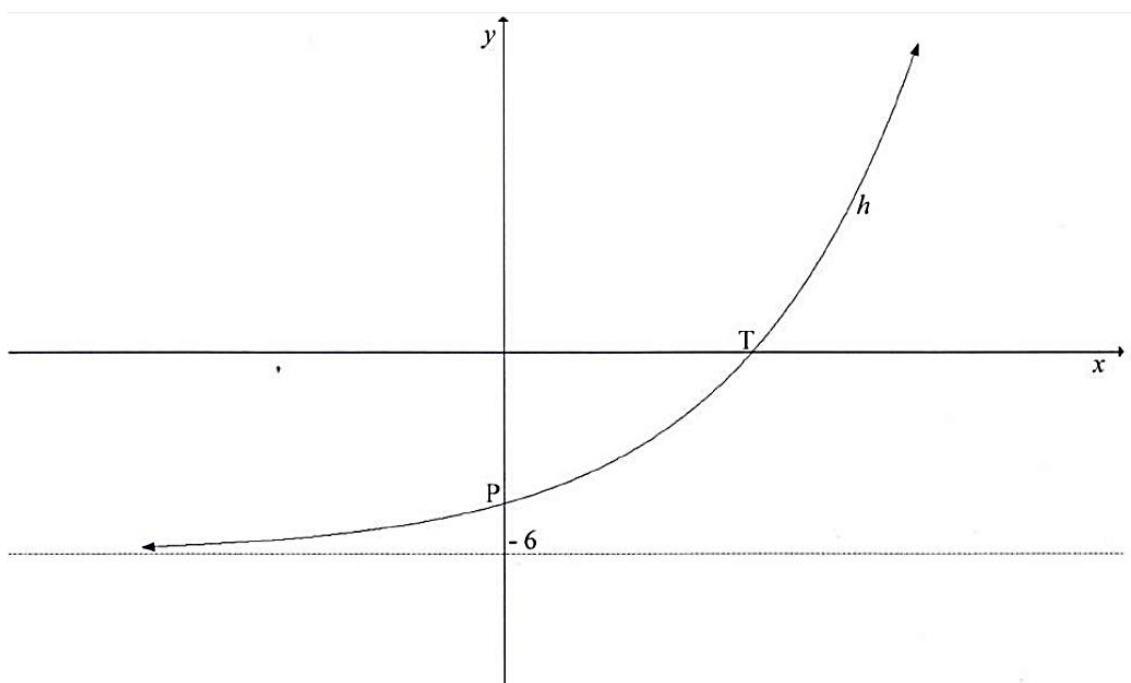
QUESTION 6

Given: $f(x) = \frac{8}{x-2} + 3$

- 6.1 Write down the equations of the asymptotes of f . (2)
- 6.2 Calculate the x - and y -intercepts of f . (3)
- 6.3 Sketch the graph of f . Show clearly the intercepts with the axes and the asymptotes. (3)
- 6.4 If $y = x + k$ is an equation of the line of symmetry of f , calculate the value of k . (2)
- [10]**

QUESTION 7

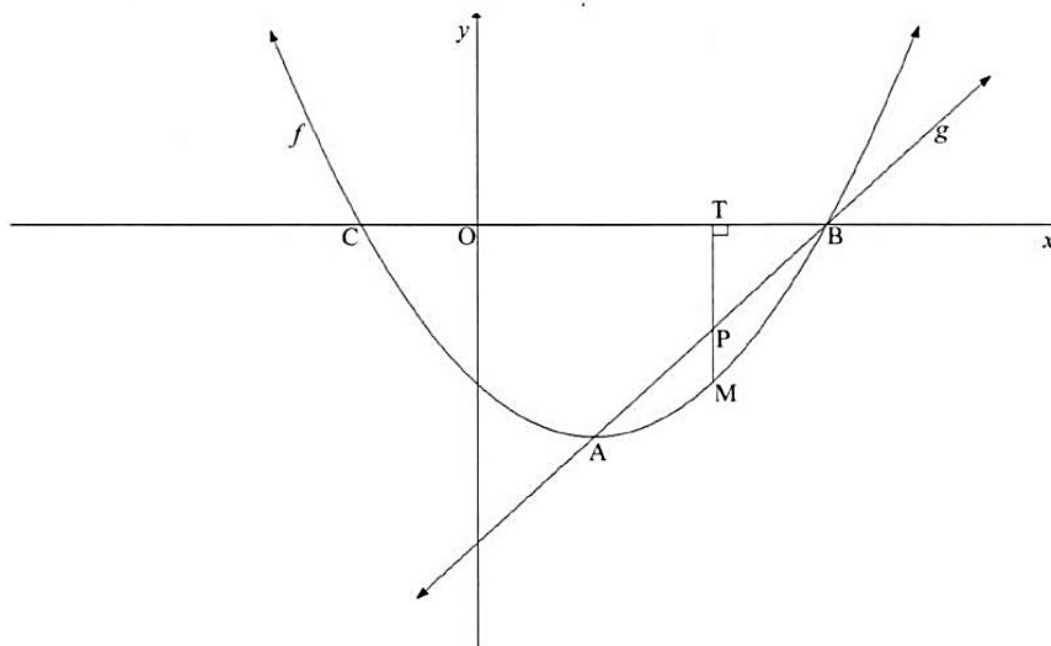
Given: $h(x) = a \cdot 2^{x-1} + q$. The line $y = -6$ is an asymptote to the graph of h . P is the y-intercept of h and T is the x-intercept of h .



- 7.1 Write down the value of q . (1)
- 7.2 If the graph of h passes through the point $\left(-1; -5\frac{1}{4}\right)$, calculate the value of a . (4)
- 7.3 Calculate the average gradient between the x -intercept and the y -intercept of h . (5)
- 7.4 Determine the equation of p if $p(x) = h(x - 2)$ in the form $p(x) = a \cdot 2^{x-1} + q$. (2)
- [12]**

QUESTION 8

The graph of $f(x) = x^2 + bx + c$ and the straight line g are sketched below. A and B are the points of intersection of f and g . A is also the turning point of f . The graph of f intersects the x -axis at B(3 ; 0) and C. The axis of symmetry of f is $x = 1$.



- 8.1 Write down the coordinates of C. (1)
- 8.2 Determine the equation of f in the form $y = x^2 + bx + c$. (3)
- 8.3 Determine the range of f . (2)
- 8.4 Calculate the equation of g in the form $y = mx + c$. (3)
- 8.5 For which values of x will:
- 8.5.1 $f(x) \geq 0$ (2)
- 8.5.2 $\frac{f(x)}{g(x)} > 0$ (2)
- 8.5.3 $x \cdot f(x) > 0$ (2)
- 8.6 For what values of p will $x^2 - 2x = p$ have non-real roots? (2)
- 8.7 T is a point on the x -axis and M is a point on f such that $TM \perp x$ -axis. TM intersects g at P. Calculate the maximum length of PM. (4)
- [21]**

QUESTION 9

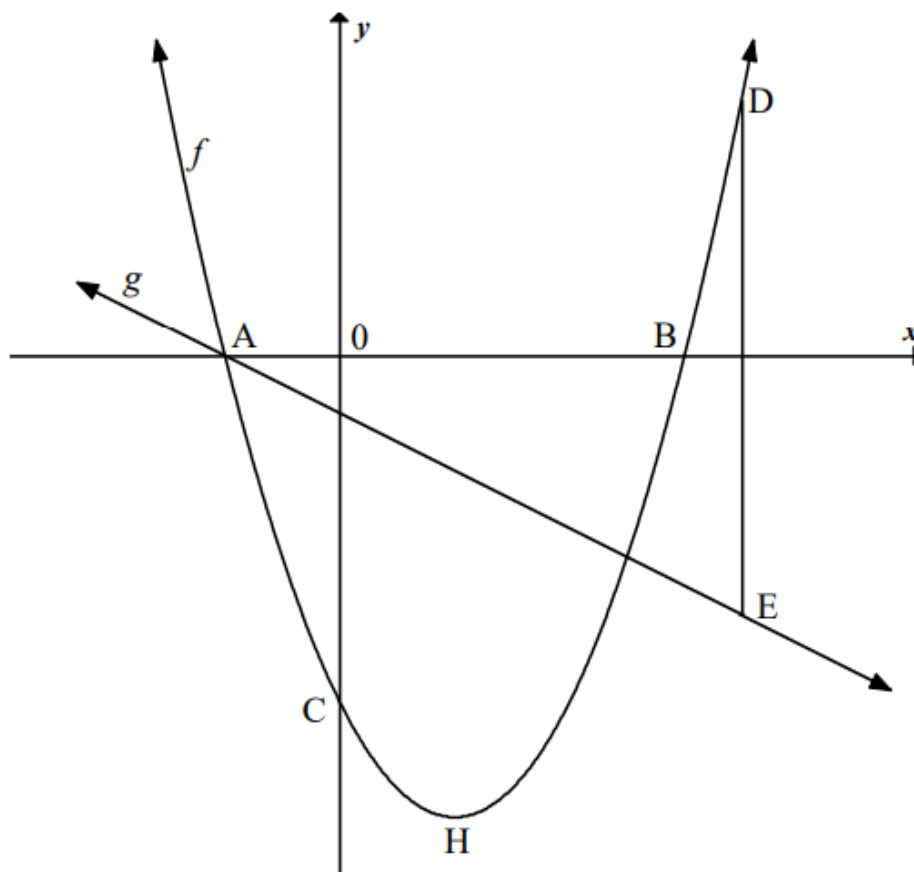
The sketch below represents the graphs of $f(x) = x^2 - 2x - 3$ and $g(x) = mx + c$.

D is a point on f and E is a point on g such that DE is parallel to the y -axis.

A and B are the x -intercepts of f .

The straight line, g , passes through point A.

H is the turning point of the graph of f .



- 9.1 Write down the domain of g . (1)
- 9.2 Determine the length of AB. (3)
- 9.3 Determine the average gradient of f between A and C. (3)
- 9.4 Determine the coordinates of H, the turning point of f . (3)
- 9.5 Determine the equation of g , if the graph of g is perpendicular to $y - 2x - 5 = 0$. (4)
- 9.6 For what values of x is $g(x) \cdot f(x) \geq 0$ if $x > 0$? (2)
- 9.7 Determine the positive x -value for which $DE = 7,5$ units. (5)
- 9.8 Use the graph to determine for which value(s) of k will $f(x) = k$ have non-real roots. (1)

[22]

QUESTION 10

Given: $f(x) = -\left(\frac{1}{4}\right)^x + 4$

- 10.1 Write down an equation of the asymptote of f . (1)
- 10.2 Determine the coordinates of the y -intercept of f . (2)
- 10.3 Determine the coordinates of the x -intercept of f . (3)
- 10.4 Sketch a graph of $y = f(x)$, clearly indicating the asymptote and the coordinates of all intercepts with the x - and y -axes. (4)
- 10.5 If the graph of f is now reflected in the line $y = 4$ to create the graph of k , write down a formula for k in the form $y = \dots$ (2)
- [12]**

QUESTION 11

Given: $f(x) = \frac{3}{x+p} + q$

- 11.1 If the asymptotes of f intersect in the point $(5 ; 1)$, determine the values of p and q . (2)
- 11.2 The graph of f is translated 1 unit right and 4 units up to create the graph of h . Write down an equation for h in the form $y = \dots$ (2)
- [4]**

QUESTION 12

Given: $f(x) = ax^2 + bx + c$

$(m - 5)$ and $(m + 3)$ are roots of f .

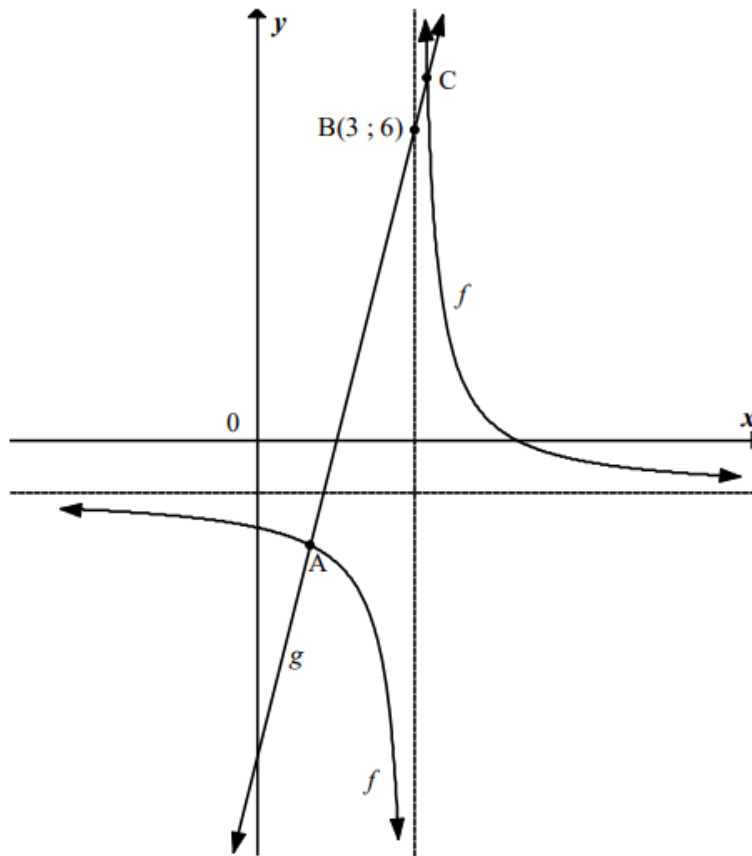
The maximum value of f occurs when $x = 2$.

- 12.1 Calculate the value of m . (3)
- 12.2 Determine the equation of f , in the form $y = ax^2 + bx + c$, if it is also given that $f(1) = 15$. (5)
- [8]**

QUESTION 8

The sketch below represents the graphs of $f(x) = \frac{2}{x-3} - 1$ and $g(x) = dx + e$.

Point B (3 ; 6) lies on the graph of g and the two graphs intersect at points A and C.



- 8.1 Write down the equations of the asymptotes of f . (2)
 - 8.2 Write down the domain of f . (2)
 - 8.3 Determine the values of d and e , correct to the nearest integer, if the graph of g makes an angle of 76° with the x -axis. (3)
 - 8.4 Determine the coordinates of A and C. (6)
 - 8.5 For what values of x is $g(x) \geq f(x)$? (3)
 - 8.6 Determine an equation for the axis of symmetry of f which has a positive slope. (3)
- [19]**

QUESTION 9

Given: $f(x) = -x^2 + 2x + 3$ and $g(x) = 1 - 2^x$

- 9.1 Sketch the graphs of f and g on the same set of axes. (9)
- 9.2 Determine the average gradient of f between $x = -3$ and $x = 0$. (3)
- 9.3 For which value(s) of x is $f(x) \cdot g(x) \geq 0$? (3)
- 9.4 Determine the value of c such that the x -axis will be a tangent to the graph of h , where $h(x) = f(x) + c$. (2)
- 9.5 Determine the y -intercept of t if $t(x) = -g(x) + 1$ (2)
- 9.6 The graph of k is a reflection of g about the y -axis. Write down the equation of k . (1)
- [20]**

DBE EXEMPLAR 13 Q10**QUESTION 10**

Sketch the graph of $f(x) = ax^2 + bx + c$ if it is also given that:

- The range of f is $(-\infty; 7]$
 - $a \neq 0$
 - $b < 0$
 - One root of f is positive and the other root of f is negative.
- [4]**

QUESTION 7

- 7.1 Calculate the effective interest rate per annum if an investment earns interest at a rate of 11,5% p.a., compounded monthly. (3)
- 7.2 Karabo bought a computer for R4 700. The value of the computer depreciated at a rate of 18% p.a. Using the reducing-balance method, calculate the book value of the computer 4 years after it was bought. (3)
- 7.3 Nhlanhla made an initial deposit of R20 000 into an investment account that paid interest at the rate of 7,2% p.a., compounded quarterly. After 2 years the interest rate changed to 7,8% p.a., compounded monthly. Four years after his initial deposit, Nhlanhla withdrew R2 500 from his investment.
- 7.3.1 Calculate how much Nhlanhla had in this investment account 2 years after the initial deposit was made. (3)
- 7.3.2 How much will the investment be worth 7 years after the initial deposit was made? (4)
- [13]**

QUESTION 7

- 7.1 A company bought machinery costing R80 000. Using the reducing balance method, the machinery had a book value of R20 000 after 5 years.
- Calculate the rate of depreciation. (3)
- 7.2 Calculate the effective interest rate if interest is compounded at 5% p.a., compounded quarterly. (3)
- 7.3 Sipho invested R30 000 for 6 years. The investment earned interest at 12% p.a., compounded monthly for the first two years. Thereafter the interest rate changed to 10,8% p.a., compounded semi-annually for the rest of the period.
- Calculate the value of the investment at the end of 6 years. (No other transactions were made on the account.) (4)
- 7.4 Mary deposited R25 000 into a savings account with an interest rate of 18% p.a., compounded monthly. Mary withdrew R8 000 from the account 2 years after depositing the initial amount. She deposited another R4 000 into this account 3½ years after the initial deposit. What amount will Mary have 5 years after making the initial deposit in this account? (6)
- [16]**

QUESTION 8

- 8.1 A machine costs R25 000 in 2016. Calculate the book value of the machine after 4 years if it depreciates at 9% p.a. according to the reducing balance method. (3)
- 8.2 The nominal interest rate of an investment is 12,35% p.a., compounded monthly. Calculate the effective interest rate. (4)
- 8.3 The value of a property increased from R145 000 to R221 292,32 over 6 years. Calculate the average annual rate of increase of the property over 6 years. (4)
- 8.4 Tebogo made an initial deposit of R15 000 into an account that paid interest at 9,6% p.a., compounded quarterly. Six months later she withdrew R5 000 from the account. Two years after the initial deposit she deposited another R3 500 into this account. How much does she have in the account 3 years after her initial deposit? (5)
- [16]**

QUESTION 8

- 8.1 A school buys tablets at a total cost of R140 000. If the average rate of inflation is 6,1% per annum over the next 4 years, determine the cost of replacing these tablets in 4 years' time. (3)
- 8.2 An investment earns interest at a rate of 7% per annum, compounded semi-annually. Calculate the effective annual interest rate on this investment. (3)
- 8.3 A savings account was opened with an initial deposit of R24 000. Eighteen months later R7 000 was withdrawn from the account. Calculate how much money will be in the savings account at the end of 4 years if the interest rate was 10,5% p.a., compounded monthly. (5)
- 8.4 A car costing R198 000 has a book value of R102 755,34 after 3 years. If the value of the car depreciates at $r\%$ p.a. on a reducing balance, calculate r . (5)
- [16]**

QUESTION 9

- 9.1 A tractor bought for R120 000 depreciates to R11 090,41 after 12 years by using the reducing balance method. Calculate the rate of depreciation per annum. (The rate was fixed over the 12 years.) (4)
- 9.2 Calculate the effective interest rate if interest is 9,8% p.a., compounded monthly. (3)
- 9.3 Mrs Pillay invested R80 000 in an account which offers the following:
- 7,5 % p.a., compounded quarterly, for the first 4 years and thereafter
 - 9,2% p.a., compounded monthly, for the next 3 years
- Calculate the total amount of money that will be in the account at the end of 7 years if no further transactions happen on the account. (4)
- 9.4 Exactly 8 years ago Tashil invested R30 000 in an account earning 6,5% per annum, compounded monthly.
- 9.4.1 How much will he receive if he withdrew his money today? (3)
- 9.4.2 Tashil withdrew R10 000 three years after making the initial deposit and re-invested R10 000 five years after making the initial deposit.
- Calculate the difference between the final amount Tashil will now receive after eight years and the amount he would have received had there not been any transactions on the account after the initial deposit. (7)
- [21]**

QUESTION 4

Sheena receives R1 500 as a gift. She invests her money in a savings account, earning interest at 15% per annum compounded semi-annually.

- 4.1 How much money does Sheena have in her investment account at the end of 5 years? (4)
- 4.2 Disa also receives R1 500, but she invests her money in an account which earns interest annually. If Sheena and Disa have the same amount of money at the end of 5 years, what annual interest rate is Disa earning? (3)
[7]

QUESTION 5

A company bought new machinery for R23 000 at the beginning of 2013. The machinery depreciates on the reducing-balance method at a rate of 13,5% per annum.

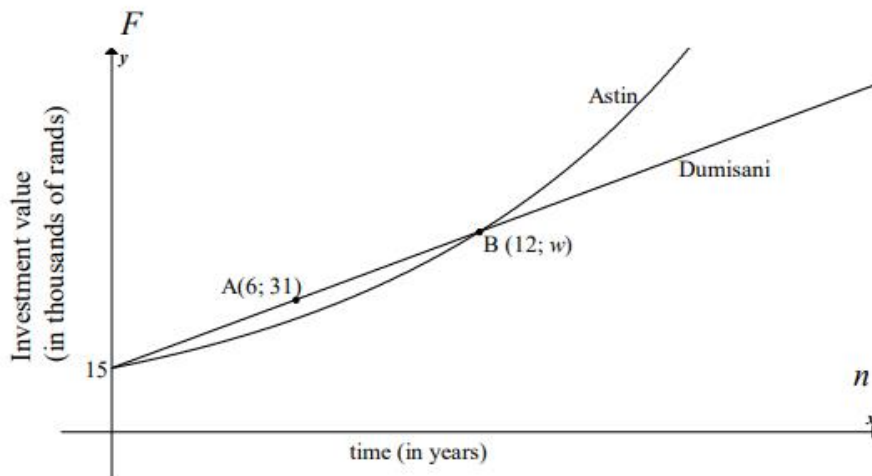
- 5.1 Determine the book value of the machinery at the end of 2017. (2)
- 5.2 Determine the expected cost of purchasing new machinery at the beginning of 2018 if the purchase price at the beginning of 2013 increases at 6,6% compounded annually. (2)
- 5.3 How much money would the company have had to invest as a lump sum at the beginning of 2013 if they wanted to pay cash for the new machinery at the beginning of 2018 and the money is invested in a bank account earning interest of 4,7% p.a., compounded monthly? (6)
[10]

QUESTION 4

- 4.1 Melissa has just bought her first car. She paid R145 000 for it. The car's value depreciates on the straight-line method at a rate of 17% per annum. Calculate the value of Melissa's car 5 years after she bought it. (2)
- 4.2 An investment earns interest at a rate of 8% per annum compounded quarterly.
- 4.2.1 At what rate is interest earned each quarter of the year? (1)
- 4.2.2 Calculate the effective annual interest rate on this investment. (2)
- 4.3 R14 000 is invested in an account.
- The account earns interest at a rate of 9% per annum compounded semi-annually for the first 18 months and thereafter 7,5% per annum compounded monthly.
- How much money will be in the account exactly 5 years after the initial deposit? (5)
[10]

QUESTION 5

The graphs below represent the growth of two investments, one belonging to Dumisani and one belonging to Astin. Both investments earn interest annually (only).



- 5.1 What is the value of both initial investments? (1)
 - 5.2 Does Dumisani's investment earn simple or compound interest? (1)
 - 5.3 Determine Dumisani's interest rate. (2)
 - 5.4 Hence or otherwise, calculate the interest rate on Astin's investment. Give your answer correct to ONE decimal place. (4)
- [8]**

PROBABILITY AND VENN DIAGRAMS

DBE NOV 18 Q8

QUESTION 8

A bag contains 6 red balls, 8 green balls and an unknown number of yellow balls. The probability of randomly choosing a green ball from the bag is 25%.

- 8.1 Show that there are 32 balls in the bag. (1)
- 8.2 A ball is drawn from the bag, the colour is recorded and it is not returned to the bag. Thereafter another ball is drawn from the bag, the colour is recorded and it is also not returned to the bag.
- Draw a tree diagram to represent ALL the possible ways in which the two balls could have been drawn from the bag. Show the probabilities associated with EACH branch, as well as the outcomes. (4)
- 8.3 Calculate the probability that the two balls drawn from the bag will have the same colour. (4)
- [9]

DBE NOV 18 Q9

QUESTION 9

- 9.1 On a flight, passengers could choose between a vegetarian snack and a chicken snack. The snacks selected by the passengers were recorded. The results are shown in the table below.

SNACK	MALE	FEMALE	TOTAL
Vegetarian	12	20	32
Chicken	55	63	118
TOTAL	67	83	150

- Was the choice of snack on this flight independent of gender? Motivate your answer with the necessary calculations. (5)
- 9.2 For any two events, A and B, it is given that $P(A \text{ and } B) = 0,12$, $P(A \text{ or } B) = 0,83$ and $P(B) = 4 P(A)$.
- 9.2.1 Are events A and B mutually exclusive? Justify your answer. (2)
- 9.2.2 Calculate $P(B)$. (4)
- 9.2.3 Calculate $P(\text{not } A)$. (2)
- [13]

QUESTION 8

- 8.1 A bag contains 3 blue marbles and 2 red marbles. A marble is taken from the bag, the colour is recorded and the marble is put aside. A second marble is taken from the bag, the colour is recorded and then put aside.
- 8.1.1 Draw a tree diagram to represent the information above. Show the probabilities associated with EACH branch, as well as the possible outcomes. (3)
- 8.1.2 Determine the probability of first taking a red marble and then taking a blue marble, in that order. (2)
- 8.2 A and B are two events. The probability that event A will occur is 0,4 and the probability that event B will occur is 0,3. The probability that either event A or event B will occur is 0,58.
- 8.2.1 Are events A and B mutually exclusive?
Justify your answer with appropriate calculations. (3)
- 8.2.2 Are events A and B independent?
Justify your answer with appropriate calculations. (3)
- [11]**

QUESTION 9

A survey was done among 80 learners on their favourite sport.
The results are shown below.

- 52 learners like rugby (R)
- 42 learners like volleyball (V)
- 5 learners like chess (C) only
- 14 learners like rugby and volleyball but not chess
- 12 learners like rugby and chess but not volleyball
- 15 learners like volleyball and chess but not rugby
- x learners like all 3 types of sport
- 3 learners did not like any sport

- | | | |
|-----|---|-------------|
| 9.1 | Draw a Venn diagram to represent the information above. | (5) |
| 9.2 | Show that $x = 8$. | (2) |
| 9.3 | How many learners like only rugby? | (1) |
| 9.4 | Calculate the probability that a learner, chosen randomly, likes at least TWO different types of sport. | (3) |
| | | [11] |

QUESTION 9

9.1 Given: $P(A) = 0,2$
 $P(B) = 0,5$
 $P(A \text{ or } B) = 0,6$ where A and B are two different events

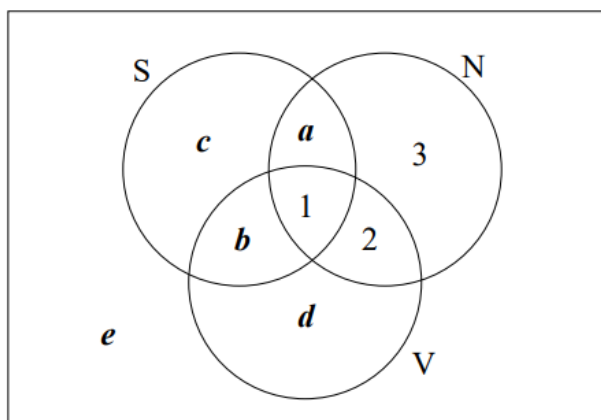
9.1.1 Calculate $P(A \text{ and } B)$. (2)

9.1.2 Are the events A and B independent ? Show your calculations. (3)

9.2 A survey was conducted amongst 100 learners at a school to establish their involvement in three codes of sport, soccer, netball and volleyball. The results are shown below.

- 55 learners play soccer (S)
- 21 learners play netball (N)
- 7 learners play volleyball (V)
- 3 learners play netball only
- 2 learners play soccer and volleyball
- 1 learner plays all 3 sports

The Venn diagram below shows the information above.



9.2.1 Determine the values of a , b , c , d and e . (5)

9.2.2 What is the probability that one of the learners chosen at random from this group plays netball or volleyball? (2)

9.3 The probability that the first answer in a maths quiz competition will be correct is 0,4. If the first answer is correct, the probability of getting the next answer correct rises to 0,5. However, if the first answer is wrong, the probability of getting the next answer correct is only 0,3.

9.3.1 Represent the information on a tree diagram. Show the probabilities associated with each branch as well as the possible outcomes. (3)

9.3.2 Calculate the probability of getting the second answer correct. (3)
[18]

QUESTION 9

- 9.1 Given: $P(A) = 0,6$
 $P(B) = 0,3$
 $P(A \text{ or } B) = 0,8$ where A and B are two different events

Are the events A and B mutually exclusive? Justify your answer with appropriate calculations and/or a diagram. (4)

- 9.2 The table below shows data on the monthly income of employed people in two residential areas. Representative samples were used in the collection of the data.

MONTHLY INCOME (IN RANDS)	AREA 1	AREA 2	TOTAL
$x < 3\,200$	500	460	960
$3\,200 \leq x < 25\,600$	1\,182	340	1\,522
$x \geq 25\,600$	150	14	164
Total	1\,832	814	2\,646

- 9.2.1 What is the probability that a person chosen randomly from the entire sample will be:

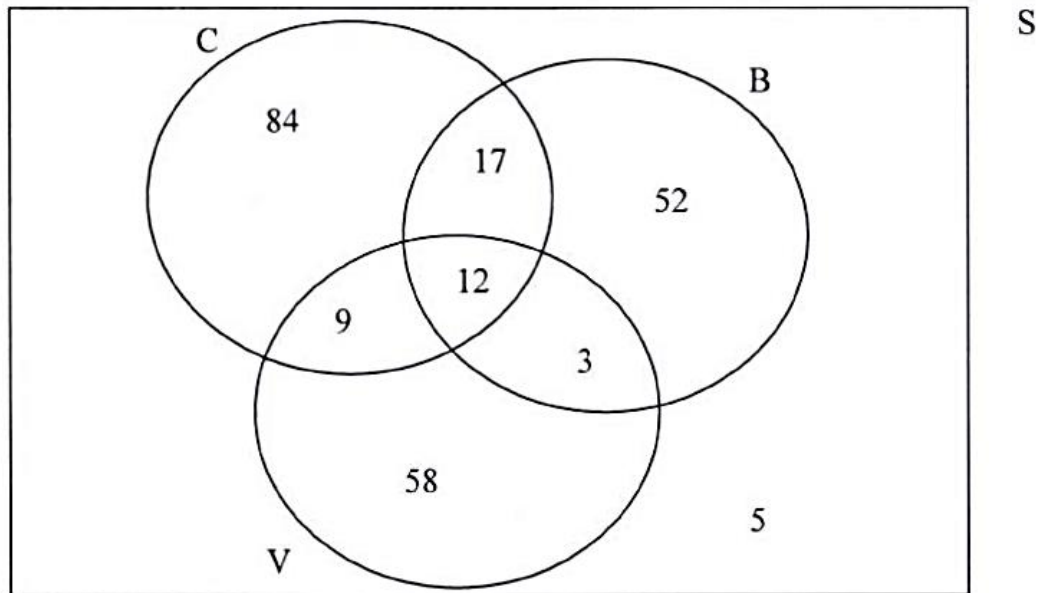
- (a) From Area 1 (2)
- (b) From Area 2 and earn less than R3 200 per month (1)
- (c) A person from Area 2 who earns more than or equal to R3 200 (2)

- 9.2.2 Prove that earning an income of less than R3 200 per month is not independent of the area in which a person resides. (5)

- 9.2.3 Which is more likely: a person from Area 1 earning less than R3 200 or a person from Area 2 earning less than R3 200? Show calculations to support your answer. (3)
- [17]**

QUESTION 10

A survey was carried out with 240 customers who bought food from a fastfood outlet on a particular day. The outlet sells cheese burgers (C), bacon burgers (B) and vegetarian burgers (V). The Venn diagram below shows the number of customers who bought different types of burgers on the day.



- 10.1 How many customers did NOT buy burgers on the day? (1)
- 10.2 Are events B and C mutually exclusive? Give a reason for your answer. (2)
- 10.3 If a customer from this group is selected at random, determine the probability that he/she:
- 10.3.1 Bought only a vegetarian burger (1)
- 10.3.2 Bought a cheese burger and a bacon burger (1)
- 10.3.3 Did not buy a cheese burger (3)
- 10.3.4 Bought a bacon burger or a vegetarian burger (4)

[12]**QUESTION 11**

Given: $P(A) = 0,12$
 $P(B) = 0,35$
 $P(A \text{ or } B) = 0,428$

Determine whether events A and B are independent or not. Show ALL relevant calculations used in determining the answer.

[4]

QUESTION 12

Paballo has a bag containing 80 marbles that are either green, yellow or red in colour. $\frac{3}{5}$ of the marbles are green and 10% of the marbles are yellow. Paballo picks TWO marbles out of the bag, one at a time and without replacing the first one.

- 12.1 How many red marbles are in the bag? (2)
- 12.2 Draw a tree diagram to represent the above situation. (3)
- 12.3 What is the probability that Paballo will choose a GREEN and a YELLOW marble? (3)
- [8]**

QUESTION 13

All the students at a certain college undergo annual HIV testing. The results of this year's testing are shown in the table below.

	HIV POSITIVE	HIV NEGATIVE	TOTAL
Male	106	422	<i>b</i>
Female	<i>a</i>	<i>d</i>	<i>c</i>
TOTAL	192	<i>e</i>	960

- 13.1 How many students are there at the college? (1)
- 13.2 Determine the values of *a*, *b*, *c*, *d* and *e*. (5)
- 13.3 Is HIV status independent of gender at this college? Motivate your answer with relevant calculations. (4)
- [10]**

QUESTION 14

A retail store did a survey of its customers and found that 30% of the customers were unhappy with the service received. Of those who were unhappy with the service, 74% said that they would not shop at that store again. Of those who were happy with the service, only 5% said that they would not shop at the store again.

- 14.1 Draw a tree diagram to represent the results of this survey, clearly indicating the probability of each overall outcome correct to THREE decimal places. (5)
- 14.2 Determine the probability that a customer selected at random says that he/she will shop at the store again. (2)
- [7]**

QUESTION 15

Two independent relay teams want to qualify for the next Olympic Games. The probability that the two teams run under the qualifying time, is $\frac{4}{9}$ and $\frac{3}{7}$ respectively. Calculate the probability that one of the relay teams will run under the qualifying time in their next race. **[4]**

QUESTION 11

Given: $P(W) = 0,4$
 $P(T) = 0,35$
 $P(T \text{ and } W) = 0,14$

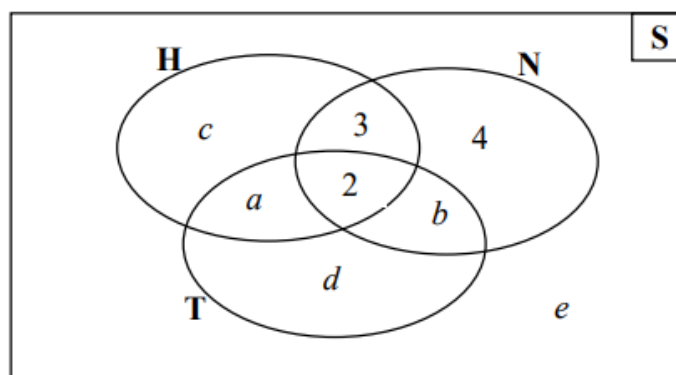
- 11.1 Are the events W and T mutually exclusive? Give reasons for your answer. (2)
- 11.2 Are the events W and T independent? Give reasons for your answer. (3)
- [5]**

QUESTION 12

12.1 A group of 33 learners was surveyed at a school. The following information from the survey is given:

- 2 learners play tennis, hockey and netball
- 5 learners play hockey and netball
- 7 learners play hockey and tennis
- 6 learners play tennis and netball
- A total of 18 learners play hockey
- A total of 12 learners play tennis
- 4 learners play netball ONLY

12.1.1 A Venn diagram representing the survey results is given below. Use the information provided to determine the values of a , b , c , d and e .



(5)

12.1.2 How many of these learners do not play any of the sports on the survey (that is netball, tennis or hockey)?

(1)

12.1.3 Write down the probability that a learner selected at random from this sample plays netball ONLY.

(1)

12.1.4 Determine the probability that a learner selected at random from this sample plays hockey or netball.

(1)

12.2 In all South African schools, EVERY learner must choose to do either Mathematics or Mathematical Literacy.

At a certain South African school, it is known that 60% of the learners are girls. The probability that a randomly chosen girl at the school does Mathematical Literacy is 55%. The probability that a randomly chosen boy at the school does Mathematical Literacy is 65%.

Determine the probability that a learner selected at random from this school does Mathematics.

(6)
[14]