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Paper I May/June Algebra



Grade 10 - Algebra June Exam Total: 50 Time: 60min

QUESTION 1

- 1.1 Rewrite 0,88 as a common fraction. (1)
- 1.2 For which value(s) of *x* is the expression undefined if

$$f(x) = \sqrt{\frac{9}{11 - x}} \text{ and } x \in \{-5, 0, 11\}?$$
 (1)

1.3 Determine between which two integers the following irrational number lies.

$$\sqrt{45}$$
[4]

QUESTION 2

2.1 Simplify:

2.1.1
$$(2x+3)(2x^2-x-2)$$
 (2)

2.1.2
$$\frac{x+3}{x-3} \times \frac{x^3-27}{x^2-9} \times \frac{x-3}{x^2+3x+9}$$
 (3)

2.1.3
$$\frac{2x^2y^{-2} \times 8x^{-5}y^8}{(2x^{-2}y^4)^2}$$
(3)

2.2 Factorise completely:

2.2.1 $2a^2 + 9a - 5$ (2)

2.2.2
$$a^2 + a(4+b) + 4b$$
 (3) [13]

QUESTION 3

3.1 Solve for *x*:

- 3.1.1 (x-a)(x+b) = 0 (2)
- $3.1.2 \quad 2^x + 2^{x-1} = 12 \tag{4}$
- 3.2 Solve for x and represent your answer on a number line if $x = N_0$. $2(2x - 3) - 18 \ge 2x$ (4)

3.3 Solve for *x* and *y* simultaneously:

$$2x + y = 64x + 3y = 10$$
 (5)

QUESTION 4

- 4.1 Given the number pattern: $\frac{1}{2}$; $\frac{2}{5}$; $\frac{6}{8}$; $\frac{8}{11}$...
 - 4.1.1 Write down the next TWO terms of the pattern. (1)
 - 4.1.2 Determine the general term. (3)
- 4.2 Given: $T_n = -2n^3$
 - 4.2.1 Determine the 8^{th} term. (1)
 - 4.2.2 Which term is -432? (2) [7]

QUESTION 5

- 5.1 Given: $f(x) = x^2 2$ and $g(x) = 3^x$
- 5.1.1 Sketch the graph of f(x) and g(x) on the same system of axes. Clearly indicate all the intercepts on the graph. (4) 5.1.2 For which value(s) of x is g(x) > 1? (1)5.1.3 Write down the range of f(x). (1)Describe in words the transformation of f(x) to h(x) = (x - 2)(x + 2). 5.1.4 (2)Determine the equation of the function $g(x) = \frac{a}{x} + q$, with the asymptote y = -2. The 5.2 straight line f(x) = -x intersects the graph of g(x) at the point (5; -5). (3)
 - [11]
 - TOTAL: 50

[15]

Memo

QUESTION 1					
1.1	0,88 =	$\frac{88}{100} = \frac{44}{50} = \frac{22}{25}$	✓ Any acceptable fraction	(1)	
1.2	x = 11 undefined		111	(1)	
1.3	Between 6 and 7		6√,7√	(2)	[4]
QUES	TION 2				
2.1	2.1.1	(2x + 3)(2x2 - x - 2) = 4x ³ - 2x ² - 4x + 6x ² - 3x - 6 = 4x ³ + 4x ² - 7x - 6	multiplication ✓ simplification ✓	(2)	
	2.1.2	$\frac{\frac{x+3}{x-3} \times \frac{x^3-27}{x^2-9} \times \frac{x-3}{x^2+3x+9}}{=\frac{x+3}{x-3} \times \frac{(x-3)(x^2+3x+9)}{(x-3)(x+3)} \times \frac{x-3}{x^2+3x+9}}{=1}$	$(x-3)(x^2+3x+9)$ (x-3)(x+3) $\checkmark\checkmark$ $1\checkmark$	(3)	
	2.1.3	$\frac{2x^2y^{-2} \times 8x^{-5}y^8}{(2x^{-2}y^4)^2}$ = $\frac{16x^{-3}y^6}{4x^{-4}y^8}$ = $4xy^{-2}$ = $\frac{4x}{y^2}$	$x^{-3}y^{6}\checkmark$ $4x^{-4}y^{8}\checkmark$ $\frac{4x}{y^{2}}\checkmark$	(3)	

		OR	OR		
		$2x^2y^{-2}8x^{-5}y^8$			
		$=\frac{4x^{-4}y^{8}}{4x^{-4}y^{8}}$	$x^{-4}y^{8}\checkmark$		
		$=\frac{2x^2.x^4.8y^8}{4y^8.y^2.x^5}$	$2x^2 \cdot x^4 \cdot 8y^8 \checkmark$		
		$=4xy^{-2}$	4 <i>x</i>		
		$=\frac{4x}{y^2}$	$\overline{y^2}$		
2.2	2.2.1	(2a-1)(a+5)	(2 <i>a</i> −1) √	(2)	
			(a+5) ✓		
	222	$a^{2} + a(4 + b) + 4b$		(3)	
	2.2.2	u + u(1 + b) + 4b		(3)	
		$=a^2+4a+ab+4b$	$4a + ab \checkmark$		
		$=(a^2+4a)+(ab+4b)$	$a(a+4) + b(a+4)\checkmark$		
		=a(a+4)+b(a+4)	Accept alternative		
		=(a+b)(a+4)	grouping		
			$(a+b)(a+4)$ \checkmark		
					[13]
QUES	STION 3				
3.1	3.1.1	(x-a)(x+b) = 0	$x = a \checkmark$	(2)	
		x-a=0 or $x+b=0$	$x = -b \checkmark$		

	x-a=0 or $x+b=0$	$x = -b \checkmark$		
	x = a or x = -b			
3.1.2	$2^x + 2^{x-1} = 12$	$2^x \checkmark$	(4)	
	$2^x \left(1 + \frac{1}{2}\right) = 12$	$\left(1+\frac{1}{2}\right)\checkmark$ or		
	$2^{x} = 8$	$(1 + 2^{-1})$		
	x = 3	$8\checkmark$ or 2^3		
		$x = 3 \checkmark$		

3.2	$2(2x-3)-18 \ge 2x$	Simplification	(4)	
	$4x - 6 - 18 \ge 2x$	$4x-6\checkmark$		
	$4x - 2x \ge 6 + 18$	$x \ge 12 \checkmark$		
	$2x \ge 24$			
	$x \ge 12$			
	• • • • • • • • • • • • • • • • • • •	Representing on the number line and 12 included ✓ and arrow ✓		
		NOTE: If 12 is included with a line - 1mark		

3.3	$2x + y = 6 \dots \dots$			
	$4x + 3y = 10 \dots 2$			
	$y = 6 - 2x \dots \dots \dots 3$	$y = 6 - 2x \checkmark$		
	Sub 3 in 2	substitution✓		
	4x + 3(6 - 2x) = 10			
		$18-6x \checkmark$		
	4x + 18 - 6x = 10	$x = 4 \checkmark$		
	-2x = -8			
	x = 4	$y = -2 \checkmark$		
	Sub $x = 4$ in equation 1			
	2(4) + y = 6			
	8 + y = 6			
	y = -2			
	Alternative method (elimination method)			
	$2x + y = 6 \dots \dots$			
	$4x + 3y = 10 \dots \dots 2$			
	Multiply equation 1 by 2	Multiply by 2 \checkmark		
	$4x + 2y = 12 \dots 3$			
	$4x + 3y = 10 \dots 2$			
	Subtract equation 2 from equation 3	Eliminating $x \checkmark$		
	-y = 2			
	$\therefore y = -2$			
	Sub $y = -2$ in equation 2	$y = -2 \checkmark$		
	4x + 3(-2) = 10			
	4x - 6 = 10	Substitution ✓		
	4x = 16			
	x = 4	$x = 4 \checkmark$	(5)	[15]

QUESTION 4					
4.1	4.1.1	$\frac{10}{14};\frac{12}{17}$	✓14 ✓ 17	(2)	
	4.1.2	Top = $2n$ Bottom = $3n - 1$ $T_n = \frac{2n}{3n-1}$	$3n \checkmark - 1 \checkmark$	(2)	
4.2	4.2.1	$T_n = -2n^3$	-1024 ✓	(1)	
	4.2.2	$T_8 = -2(8)^3$ $T_8 = -1024$	T 100 (
	4.2.2	$-432 = -2n^{3}$ $\frac{-432}{-2} = \frac{-2n^{3}}{-2}$ $216 = n^{3}$ $6 = n$	$T_n = -432 \checkmark$ $6 = n \checkmark$	(2)	
					[7]

QUES	STION 5			
5.1	5.1.1	$f(x) = x^{2} - 2$ $g(x) = 3^{x}$ $x -1 = 0 = 1$ $y -1 = -2 = -1$ $x -1 = 0 = 1$ $y = \frac{1}{3} = 1 = 3$	f(x) and $g(x)$ y-intercept $\checkmark \checkmark$	
		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	✓✓ shape both graphs	(4)
	5.1.2	x > 0	$x > 0 \checkmark$	(1)
	5.1.3	$y \ge -2$ OR $[-2;\infty)$	$y \ge -2\checkmark$ OR $[-2;\infty)\checkmark$ (brackets MUST be correct)	(1)
	5.1.4	2 units down	2 down√√	(2)
5.2	$g(\mathbf{x}) =$ $-5 = \frac{a}{5}$ $-15 =$	$\frac{a}{x} + q$ - 2 a	substitution of asymptote ✓	(3)
	g(x) =	$\frac{-15}{x} - 2$	$(5;-5) \checkmark$ $a = -15\checkmark$	[11]
			TOTAL:	50



Paper 2 May/June Geometry



Grade 10 - Trig and Geometry (Paper 2) June Exam Total: 50 Time: 60min

QUESTION 1

1.1 If point P(x; y) is a point on the Cartesian plane and OP = r units. Determine $\frac{\sin \theta}{\cos \theta}$.



1.2 In $\triangle PQR$, $\hat{Q} = 90^{\circ}$ and $\hat{R} = \theta$. PQ = 5 units, QR = 12 units and PR = 13 units.



Write down the values of:

1.2.1	$\sin \theta$
1.2.2	$\sec\theta$

1.2.3 $\tan\theta$

(3)

[6]

2.1	$5\sin\theta + 3\cot\theta$	(5)
2.2	$25\cos^2\theta$	(2)
		[7]

QUESTION 3

3.1 If $x = 42^{\circ}$ and $y = 68^{\circ}$, by using a calculator, determine the value of:

3.1.1	$\sin x + 2\cos 3y$	(2)
-------	---------------------	-----

3.1.2
$$3\tan^2(x+y)$$
 (2)

3.2 Determine the value of θ , if $\theta \in 0^{\circ} \le \theta \le 90^{\circ}$, correct to 3 decimal places.

3.2.1	$2\sin\theta = 1,432$	(2)
3.2.2	$\tan 3\theta = 6,345$	(3)

[9]

4.1 In the diagram below BDFE is a rectangle with BD = 155 m. AD = 475 m and BC = 800 m. The angle of elevation from B to C is 22°.



Calculate:

4.1.1	Â	(2)
4.1.2	CF	(3)

4.2 Without the use of a calculator, calculate the value of :

 $\sin^2 45^\circ - \cos 60^\circ + \tan 10^\circ. \cot 10^\circ$ (4)

[9]



Determine, with reasons, the sizes of the following angles:

$5.1 \hat{P}_1$	(2)
\tilde{P}_2	(3)

QUESTION 6

In quadrilateral ABCD, AD//BC and $\hat{B} = \hat{D}$. Prove that ABCD is a parallelogram.



7.1 In the quadrilateral, diagonals, AC and BD bisect at O. If AC = 4xy; $BC = x^2 + y^2$ and $BD = 2x^2 - 2y^2$, prove that ABCD is a rhombus.



7.2 PQRS is a parallelogram, SR = ST and $\hat{P} = 120^{\circ}$.



If $\hat{S}_2 = 4x$, calculate the value of x.

(4)

(5)

ANSWER SHEET 1

QUESTION 4



QUESTION 5



ANSWER SHEET 2

QUESTION 6



QUESTION 7





Memo

	QUESTION 1		
1.1	$\frac{\sin\theta}{2}$ <u>y</u> <u>x</u>		
	$\frac{1}{\cos\theta} - \frac{1}{r} \cdot \frac{1}{r}$	✓ <u>y</u>	
	$-\frac{y}{r}$	r	
	$-r^{2}x$	$\checkmark \frac{x}{-}$	
	$=\frac{y}{y}$	r	
	x	• simplification (3)	
		Answer only	
		1/3	
1.2.1	$\sin \theta - \frac{PQ}{5} - \frac{5}{5}$		
	PR^{-13}	✓ answer	
		(1)	
1.2.2	<i>PR</i> 13	(1)	
	sec $\theta = \frac{1}{OR} = \frac{1}{12}$	✓answer	
	$\mathcal{L}^{}$		
		(1)	
1.2.3	$\tan \theta = \frac{PQ}{P} = \frac{5}{2}$		
	QR 12	✓ answer	
		(1)	
		(1)	[6]

	QUESTION 2		
2.1	<i>y</i> <i>θ</i> <i>5</i> <i>P</i> (4; -3)	✓ correct quadrant	
	$4\tan\theta = -3$ $\therefore \tan\theta = -\frac{3}{4} = \frac{y}{x}$ $r^{2} = x^{2} + y$ $r^{2} = (4)^{2} + (-3)^{2}$ r = 5	$\checkmark r = 5$	
	$5\sin\theta + 3\cot\theta$ $= 5\left(\frac{-3}{5}\right) + 3\left(\frac{4}{-3}\right)$ $= -3 - 4 = -7$	$\checkmark \left(\frac{-3}{5}\right)$ $\checkmark \left(\frac{4}{-3}\right)$ $\checkmark -7$ (5)	
2.2	$25\cos^2\theta$ $= 25\left(\frac{4}{5}\right)^2$ $= 25\left(\frac{16}{25}\right)$	✓ substitution	
	= 16	✓answer (2)	[7]

	QUESTION 3		
3.1.1	$\sin x + 2\cos 3y$	Do not penalise	
	$=\sin(42^\circ)+2\cos(3\times68^\circ)$	for rounding	
	$=\sin(42^\circ)+2\cos 204^\circ$	011	
	= -1,16	$\checkmark \checkmark \text{ answer}$ (2)	
3.1.2	$3\tan^2(x+y)$	Do not penalise	
	$-3\tan^2(12^\circ \pm 68^\circ)$	for rounding	
	$-5 \tan (+2 + 66)$	off	
	$=3\tan^2 110^\circ$		
	= 22,65	✓ ✓ answer (2)	
321	$2\sin\theta - 1432$	(2)	
3.2.1	2\$110 = 1,432	for rounding	
	$\therefore \sin\theta = 0.716$	off	
	$\therefore \theta = 45,725^{\circ}$	011	
		✓✓answer	
		(2)	
3.2.2	$\tan 3\theta = 6,345$		
	$3\theta = 81,044^{\circ}$	\checkmark tan ⁻¹	
	$\therefore \theta = 27.015^{\circ}$	✓÷3	
		✓ answer	
		(3)	503
		*penailse once	[9]
		only for	
		rounding off in	
		J.2	

	QUESTION 4		
4.2			
	$\sin^{2} 45^{\circ} - \cos 60^{\circ} + \tan 10^{\circ} \cdot \cot 10^{\circ}$ $= \left(\frac{\sqrt{2}}{2}\right)^{2} - \frac{1}{2} + 1$ $= \frac{1}{2} - \frac{1}{2} + 1$ $= 1$	$\checkmark \cos 60^\circ = \frac{1}{2}$ $\checkmark \sin^2 45^\circ = \frac{1}{2}$ $\checkmark \tan 10^\circ. \cot 10^\circ = 1$	
	-	\checkmark answer = 1 (4)	
			[9]

	QUESTION 5		
5.1	$\hat{P}_1 + \hat{Q} = \hat{R}_2$ (exterior angle = sum of interior opposite angles) $\hat{P}_1 + 30^\circ = 110^\circ$	✓ reason	
	$P_1 = 110^\circ - 30^\circ$ = 80°	✓answer (2)	
5.2	$\hat{P}_{2} = \hat{S}_{1} \qquad (\angle^{s} \text{ opposite equal sides are equal})$ $\hat{P}_{2} + \hat{R}_{2} + \hat{S}_{1} = 180^{\circ} \qquad (\text{Sum of } \angle^{s} \text{ of a triangle} = 180^{\circ})$ $\therefore \hat{P}_{2} + 110^{\circ} + \hat{P}_{2} = 180^{\circ} \qquad (\text{Given} : \hat{R}_{2} = 110^{\circ} \text{ and } \hat{P}_{2} = \hat{S}_{1})$ $\therefore 2\hat{P}_{2} = 180^{\circ} - 110^{\circ}$	✓ statement and reason ✓ statement and reason	
	$\therefore 2\hat{P}_2 = 70^{\circ}$ $\therefore \hat{P}_2 = 35^{\circ}$ OR $\hat{P}_2 = \hat{S}_1 \qquad (\angle^{S} \text{ opposite equal sides are equal})$ $\hat{R}_1 = \hat{P}_2 + \hat{S}_1 \qquad (\text{exterior angle} = \text{sum of interior opposite angles})$	 ✓ simplification (3) OR ✓ statement and reason ✓ statement and reason 	
	$\therefore P_2 = 35^{\circ}$	✓ simplification (3)	[5]
	QUESTION 6		
	In $\triangle ABC$ and $\triangle CDA$ $\hat{B} = \hat{D}$ (given) AC is common $\hat{C}_1 = \hat{A}_2$ (alternate angles ; AD // BC) $\therefore \triangle ABC \equiv \triangle CDA$ (\angle ; \angle ; S) $\therefore AD = BC$ ($\triangle ABC \equiv \triangle CDA$) $\therefore ABCD$ is a parallelogram (one side = //)	$\checkmark \hat{C}_1 = \hat{A}_2$ $\checkmark \text{Reason}$ (AD // BC) $\checkmark \text{S} + \text{R}$ $\checkmark \text{AD} = \text{BC}$ $\checkmark \text{reason}$ (one side = //)	
	OR In $\triangle ABC$ and $\triangle CDA$ $\hat{B} = \hat{D}$ (given) AC is common $\hat{C}_1 = \hat{A}_2$ (alternate angles ; AD // BC) $\therefore \triangle ABC = \triangle CDA$ (\angle ; \angle ; S) $\therefore AD = BC$ ($\triangle ABC = \triangle CDA$) $\therefore AB = DC$ ($\triangle ABC = \triangle CDA$) $\therefore AB = DC$ ($\triangle ABC = \triangle CDA$)	OR ✓ Statement ✓ Reason (AD // BC) ✓ S + R ✓ AD = BC ✓ reason (opposite sides =)	

	[5]

	QUESTION 7		
7.1	AO + OC = 4xy (given – diagonals bisect) OC = 2xy	\checkmark OA = 2 <i>xy</i>	
	BO + OD = $2x^2 - 2y^2$ (given – diagonals bisect) BO = $x^2 - y^2$	✓ BO = $x^2 - y^2$	
	If rhombus – diagonals bisect at 90°		
	LHS = BC^2 RHS = $BO^2 + OC^2$	✓ LHS	
	$= (x^{2} + y^{2})^{2} = (x^{2} - y^{2})^{2} + (2xy)^{2}$ OR = $x^{4} + 2x^{2}y^{2} + y^{4} = x^{4} - 2x^{2}y^{2} + y^{4} + 4x^{2}y^{2}$	✓RHS	
	$= x^{4} + 2x^{2}y^{2} + y^{4}$ OR = $(x^{2} + y^{2})^{2}$	✓ conclusion	
	∴ ΔBOC is a right angled triangle OR Prove ΔAOD as a right angled triangle ∴ Diagonals bisect each other at 90°/right angles ∴ ABCD is a Rhombus	Conclusion	
		(5)	
7.2	$R_1 = 120^{\circ}$ (opposite angles of a // ^m)	$\checkmark R_1 = 120^\circ$	
	$R_2 = 60^{\circ}$ (angles on a straight line)	$\checkmark \hat{T} = 60^{\circ}$	
	$\hat{I} = 60^{\circ}$ (angles opposite equal sides) $\hat{S} = 60^{\circ}$ (sum of angles of a triangle)	$\checkmark \hat{S} = 60^{\circ}$	
	$\therefore 4x = 60^{\circ}$	$\checkmark x = 15^{\circ}$	
	$x = 15^{\circ}$	(4)	
			[9]

TOTAL: 50



Paper 3 May/June Algebra



Grade 10 - Algebra (Paper 1) June Exam Total: 50 Time: 60min

QUESTION 1

Indicate whether each of the following numbers is rational or irrational.

1.1	8	(1)

$$1.2 \quad \frac{2}{3}\pi\tag{1}$$

1.3
$$\frac{6}{7} + \sqrt[3]{8}$$
 (1)

[3]

[5]

QUESTION 2

Simplify:

$$2.1 \qquad \left(\frac{5}{12}\right)^0 \tag{1}$$

$$2.2 \quad \frac{-1}{-x^{-1}} \tag{1}$$

$$2.3 \qquad \frac{9^{x+1} \cdot 5^{x+2}}{45^{x+1}} \tag{3}$$

QUESTION 3

Factorise the following completely:

3.1	$2x^2 - 14x - 60$	(3)
3.1	2x - 14x - 60	(.

$$3.2 \quad \frac{1}{8}x^3 + b^9 \tag{2}$$

Solve for x:

$$4.1 \qquad 2 - 3x = 6 - 4x \tag{2}$$

4.2
$$\frac{x}{2+x} + \frac{x}{3-x} = \frac{3x-2}{x^2 - x - 6}$$
 (5)

$$4.3 \qquad 3^x . 9^{2x+1} = 81 \tag{3}$$

$$\begin{array}{ccc}
4.4 & -4 \le 3x - 1 \le 5 \\ [13]\end{array}$$

QUESTION 5

Consider the following pattern.





5.1	Write down the formula for the general term of white circles in the pattern.	(2)
5.2	Write down the formula for the general term of black circles in the pattern.	(1)
5.3	Use these formulas and calculate	
	5.3.1 the number of black circles in pattern 12.	(1)
	5.3.2 the pattern number if there are 150 white circles in the pattern.	(2) [6]

The graphs of $f(x) = ax^2$ and $h(x) = \frac{2}{3}x + 2$ are sketched below.



6.1	Determine the equation of the parabola <i>f</i> .	(2)
6.2	Calculate the coordinates of <i>C</i> if the equation of the parabola is $f(x) = \frac{4}{9}x^2$.	(5)
6.3	Calculate the length of WO.	(2)
6.4	D and T are symmetrical about the line $y = x$. Write down the coordinates of T.	(1) [10]

QUESTION 7

Determine the point of intersection of $y=3.2^{x}+1$ and $y=\frac{6}{x}+1$ graphically. Clearly show ALL asymptotes as well as *x*-intercepts and *y*-intercepts where applicable. (8) [8]

TOTAL : 50

Memo

OUESTION 1				
1.1	Rational	✓ (1)		
-				
1.2	Irrational	✓ (1)		
1.3	Rational	✓ (1)		
		[3]		
QUES	STION 2			
2.1	$\left(\begin{array}{c}5\end{array}\right)^{0}$	1		
	$\left(\frac{12}{12}\right)$	✓ answer		
	=1			
22	_1			
2.2		✓answer		
	-x = r	(1)		
-				
2.3	$0^{x+1} 5^{x+2}$			
	$\frac{1}{45} \frac{1}{15} \frac$			
	$(2)^{x+1} - x + 2$			
	$=\frac{(3^2)}{(3^2)^{3/2}}$			
	$(3^2.5)^{x+1}$			
	$3^{2x+2}.5^{x+2}$	$\checkmark 3^{2x+2}$		
	$=\frac{1}{3^{2x+2}5^{x+1}}$	$\checkmark 3^{2x+2}.5^{x+1}$		
	$= 3^{2x+2-(2x+2)} 5^{x+2-(x+1)}$	✓answer		
	$=5^{1}$	(3)		
		[5]		
-		[0]		
QUE	STION 3			
3.1	$2x^2 - 14x - 60$	✓ common factor		
	=2(x-10)(x+3)	\checkmark (x-10)		
		\checkmark (x+3)		
		(3)		
3.2	$\frac{1}{2}r^{3}+b^{9}$			
	8	✓ first factor		
	(1, 1, 3)(1, 2, 1, 3, 1, 6)	✓ second factor		
	$=\left(\frac{-x+b^{\circ}}{2}\right)\left(\frac{-x^{\circ}-b^{\circ}x+b^{\circ}}{4}\right)$	(2)		
		[5]		
L		[ຍ]		

QUES	STION 4	
4.1	2 - 3x = 6 - 4x	
	4x - 3x = 6 - 2	✓ transposing
	x = 4	✓answer
		(2)
4.2	x x $3x-2$	
	$\frac{1}{2+x} + \frac{1}{3-x} = \frac{1}{x^2 - x - 6}$	χ change sign x
	r r $3r-2$	• change sign $-\frac{1}{x-3}$
	$\frac{x}{r+2} - \frac{x}{r-3} = \frac{3x+2}{(r-3)(r+2)}$	✓ common denominator
	x + 2 $x + 3$ $(x + 3)(x + 2)$	(x+2)(x-3)
	x(x-5)-x(x+2)=5x-2	\checkmark simplify $r^2 - 3r - r^2 - 2r$
	$x^2 - 3x - x^2 - 2x = 3x - 2$	$\checkmark = 8x = -2$
	-8x = -2	$- 0 \lambda = - 2$
	1	• answer
	$x = \frac{1}{4}$	(5)
		(3)
4.3	$3^{x}.9^{2x+1} = 81$	
	$3^x \cdot 3^{4x+2} = 3^4$	
	$3^{5x+2} = 3^4$	✓ same bases
	5x + 2 = 4	✓ equating indices
	2	✓answer
	$x = \frac{1}{5}$	(3)
4.4	$-4 \le 3x - 1 \le 5$	
	$-4+1 \le 3x \le 5+1$	\checkmark add 1 to both sides
	$-3 \le 3x \le 6$	\checkmark ÷3: on both sides
	$\div 3:$ $-1 \le x \le 2$	✓answer
		(3)
		[13]

QUESTION 5				
	Pattern 1			
	Pattern 2			
	Pattern 3			
5.1	$T_n = 7n + 3$	$\checkmark 7n$		
		√ 3		
		(2)		
5.2	$T_n = 2n$	$\checkmark 2n$		
		(1)		
5.3.1	$T_{12} = 2(12)$	✓ answer		
	= 24	(1)		
5.3.2	$T_n = 7n + 3$			
	150 = 7n + 3	✓ = 150		
	n-21	\checkmark n=21		
		(2)		
		[6]		







Paper 4 May/June Geometry


Grade 10 - Trig and Geometry (Paper 2) June Exam Total: 50 Time: 60min

QUESTION 1

In the diagram below point, P(4;3) is given and $0^{\circ} \le \theta \le 90^{\circ}$. Answer the following questions, without the use of a calculator.



1.1	Calculate the length of OP.	(3)
1.2	Calculate the value of	
	1.2.1 sin θ .	(1)
	1.2.2 $\cos \theta$.	(1)
	1.2.3 $\sin^2 \theta + \cos^2 \theta$.	(2) [7]

QUESTION 2

2.1 Use a calculator to find the values of the following, correct to THREE decimal places.

2.1.1 $3\sin 138,7^{\circ}$ (1)

2.1.2
$$\sec 50^{\circ}$$
 (1)

2.1.3
$$\frac{4\tan^2 288,2^\circ.\cos 164,6^\circ}{\sin 199,4^\circ}$$
(2)

2.2 Determine, without the use of a calculator, the value of.

2.2.1 $\cos 30^\circ + \tan 60^\circ$. (3)

2.2.2
$$\frac{\sin 45^{\circ}}{\cos 45^{\circ}} - 5\csc 90^{\circ} + 3\tan^2 30^{\circ}.$$
 (5)

[12]

Determine the value of θ by using a calculator if $0^{\circ} \le \theta \le 90^{\circ}$.

3.1	$\tan\theta = 4,96$	(1)

 $3.2 \quad 2\sin(2\theta - 10^\circ) = 1 \tag{3}$

QUESTION 4

Given: $\frac{f(x)=2\tan x}{g(x)=\cos x+1}$

- 4.1 Draw both sketch graphs on the same set of axes on the ANSWER SHEET provided on the last page, for $x \in [0^\circ; 360^\circ]$. (6)
- 4.2 Use the graphs to answer the following questions.
 - 4.2.1 Write down the amplitude of g. (1)
 - 4.2.2 Determine the period of f. (1)
 - 4.2.3 Determine the range of g. (2)

QUESTION 5

- 5.1 Name TWO properties of a rhombus. (2)
- 5.2 The diagram below shows is parallelogram ABCD. $\hat{A}=x+20^{\circ}$ and $\hat{C}=2x-60^{\circ}$. Determine the value of \hat{C} . (2)



[4]

[4]

[10]

6.1 Prove that the opposite sides in parallelogram ABCD are equal.



6.2 In the figure below, AECF is a parallelogram and AD//BC.



Prove that:

- 6.2.1 $\hat{E}_1 = \hat{F}_2.$ (3)
- 6.2.2 ABCD is a parallelogram. (5)
 - [13]

(5)

TOTAL: 50

DIAGRAM SHEET

QUESTION 5

5.2



QUESTION 6

6.1



6.2



ANSWER SHEET

HAND THIS ANSWER SHEET IN TOGETHER WITH YOUR ANSWER BOOK.



Memo

QUES	STION 1				
1.1	$OP^2 = ($	$OP^{2} = (4)^{2} + (3)^{2} \dots Py thagoras$			
	$OP^2 = 2$	25	$\checkmark OP^2 = 25$		
	OP=5		✓ <i>OP</i> =5		
			(3)		
1.2	1.2.1	$\sin \theta$	1 answor		
		$=\frac{3}{2}$	• allswei (1)		
		5	(1)		
	1 2 2	act 0			
	1.2.2		✓ answer		
		$=\frac{4}{3}$	(1)		
	1.2.3	$\sin^2\theta + \cos^2\theta$			
		$-\left(\frac{3}{2}\right)^{2}+\left(\frac{4}{2}\right)^{2}$	<i>,</i> 4		
		-(5) $+(5)$	$\sqrt{-5}$		
		$-\frac{9}{16}$			
		25 25	✓ answer		
		=1	(2)		
			[7]		

QUES	STION 2			
PENA	LISE J	UST ONCE FOR INCORRECT ROUNDING-OFF.	1	
0.1	0.1.1	2 : 120 70		
2.1	2.1.1	3sin138,7°	1 answer	
		=1,980	· answer	(1)
				(-)
	2.1.2	sec 50°		
		=1,556	✓ answer	
				(1)
	213	4, 2000,00, 1,64,60		
	2.1.5	$\frac{4\tan 288,2^{\circ}.\cos 164,6^{\circ}}{\sin 100.48}$		
		sin 199,4°	✓✓ answer	
		=107,402		(2)
2.2	0.0.1			
2.2	2.2.1	$\cos 30^\circ + \tan 60^\circ$	5	
		$=\frac{\sqrt{3}}{\sqrt{3}}+\sqrt{3}$	$\checkmark \frac{\sqrt{3}}{2}$	
		2	$\frac{2}{\sqrt{2}}$	
		$-\frac{\sqrt{3}+2\sqrt{3}}{2}$	✓ √3	
		2	✓ answer	
		$3\sqrt{3}$		(3)
		$-\overline{2}$		~ /
	2.2.2	$\frac{\sin 45^{\circ}}{5\cos ec} = 5\cos ec 90^{\circ} + 3\tan^2 30^{\circ}$		
		cos 45°	$\checkmark \frac{\sin 45^\circ}{1-1} = 1$	
		$\sqrt{2}$	$\cos 45^{\circ}$	
		$-\frac{2}{2}-5(1)+3(\frac{1}{2})^{2}$	$\checkmark \cos ec 90^\circ = 1$	
		$\int \frac{1}{\sqrt{2}} \sqrt{2} \sqrt{3} \sqrt{3}$	$\checkmark \tan 30^\circ = \frac{1}{\sqrt{2}}$	
		$\overline{2}$	$\sqrt{3}$	
		-1 - 5 + 3(1)	$\checkmark \frac{1}{2}$	
		$\left[-1-5+5\left(\frac{1}{3}\right)\right]$	3	
		=-3	• answer	(5)
		1		[12]

-

QUES	STION 3			
3.1	$\tan\theta = 4$	4,96		
	$\theta = 7$	8,60°	✓ answer	
-				(1)
3.2	2 ain (2)	(1,0) 1		
5.2	2811(20	$(-10)^{-10}$		
	$\sin(2\theta$	$(-10^{\circ}) = \frac{1}{2}$	✓ divide by 2	
	(20-	$-10^{\circ})=30^{\circ}$	√ 30°	
		$2\theta = 40^{\circ}$		
		$\theta = 20^{\circ}$	✓ answer	(3)
				[<u>4</u>]
QUES	STION 4			
4.1	→ ^y 2 → 0 -2 →	90° 180° 270° 360° x	$f(x) = 2 \tan x$ $\checkmark \text{ shape}$ $\checkmark \text{ asymptote}$ $\checkmark (45^\circ; 2)$ $g(x) = \cos x + 1$ $\checkmark \text{ shape}$ $\checkmark x \text{ -intercept}$ $\checkmark y \text{ -intercept}$	(6)
4.2	4.2.1	1	✓ answer	(1)
				(1)
	4.2.2	180°	✓ answer	
				(1)
	4.2.3	$y \in [0;2]$ OR $0 \le y \le 2$	 ✓ critical values ✓ correct bracked inequality 	s ets/ (2)
				[10]

QUE	STION 5		
5.1	Both pairs of opposite sides are parallel		
	All sides are equal.		
	Diagonals bisect the angles.		✓ ✓ any two
	Diagonals disect at right angles.		answers (2)
	Both pairs of opposite angles are equal.		(2)
5.2		$x+20^{\circ}$ B $2x-60^{\circ}$	
	$\hat{A} = \hat{C}$	C Opp angles of // ^m	✓ statement
	$x + 20^{\circ} = 2x - 60^{\circ}$		
	$r = 80^{\circ}$. (an arrivan
	$\lambda = 60$		• answer (2)
	$C = 100^{\circ}$		(2)
			[4]
OUE	STION 6		
QUE			
6.1	$A \xrightarrow{2} $	B 12 C	
	Construct diagonal AC		
	In $\triangle ADC$ and $\triangle ABC$		\checkmark construction
	AC = AC	Common	altomato or les
	$\hat{A}_1 = \hat{C}_1$	Alternate angles AB//DC	✓ alternate angles
	$\hat{A}_2 = \hat{C}_2$	Alternate angles AD//BC	\checkmark alternate angles
	$\Delta ADC \equiv \Delta ABC$	s<<	AD//BC
	$\therefore AB = DC$		$\checkmark \Delta ADC \equiv \Delta ABC$
	$\therefore AD = BC$	$\Delta ADC \equiv \Delta ABC$ $\Delta ADC \equiv \Delta ABC$	\checkmark AB = DC AND AD = BC
			(5)

6.2		A E B 2		
	6.2.1	$\hat{F}_{1} = \hat{E}_{2}$ $\hat{F}_{1} + \hat{F}_{2} = \hat{E}_{1} + \hat{E}_{2} = 180^{\circ}$ $\therefore \hat{F}_{2} = \hat{E}_{2}$	Alternate angles AF//EC Angles on straight line	✓ statement and reason ✓ statement and reason ✓ : $\hat{F}_2 = \hat{E}_2$ (3)
				(3)
	6.2.2	In $\triangle AFD$ and $\triangle BEC$ AF = EC $\hat{D}_1 = \hat{B}_2$ $\hat{F}_2 = \hat{E}_1$ $\therefore \triangle AFD \equiv \triangle BEC$ AD = BC AB//BC ABCD is a parallelogram	Opposite sides // ^m Alternate angles AD//BC proved $s \ll \Delta AFD \equiv \Delta BEC$ One pair of opp sides =//	✓ identify correct Δ ✓ AF = EC ✓ $\therefore \Delta AFD \equiv \Delta BEC$ ✓ AD=BC ✓ reason (5) [13]
				TOTAL: 50



Paper 5 May/June Algebra



Grade 10 - Algebra (June Exam) Total: 100 Time: 120min

QUESTION 1: Factorise completely

1.1.
$$3x^2 - 48y^2$$
 (3)

1.2. $14x^3y^2z - 35xyz^2 + 7xy^4z$ (2)

1.3.
$$5a(x-y) - 3b(y-x)$$
 (3)

1.4.
$$2x^2 + 3x - 5$$
 (2)

1.5.
$$x^2(x^3 - 64) - 25(x^3 - 64)$$
 (4)

QUESTION 2: Expand and/or simplify completely

2.1.
$$(3x - y)(9x^2 + 3xy + y^2)$$
 (2)

2.2.
$$2x^2 + xy - [(3x + 2y)(x + 4y)]$$
 (4)

2.3.
$$\frac{2x+3}{3} - \frac{x-7}{4} + x$$
 (3)

2.4.
$$\frac{3xy^2 - 3x^2y}{9x - 9y}$$
 (4)

2.5.
$$\frac{4x^2 - 1}{x + 5} \times \frac{x^2 + 11x + 30}{2x - 1} \div \frac{x + 6}{2}$$
 (4)

2.6.
$$\frac{(2x)^3 (3xy^{-2})^2}{24(xy^2)^{-3}}$$
(4)

QUESTION 3: You are given the following sequence of diagrams



3.1.1. Complete the table below:

3.2.

Diagram number (n)	1	2	3	4	10	 n
Number of squares (T_n)	1	5	а	b	С	 (formula)

(4)

3.1.2.	How many grey squares are there in the 21 st diagram?	(1)
3.1.3.	How many grey squares are there in total in the first 21 diagrams?	(2)
Given	that the value of the n- <i>th</i> term for a particular sequence is $T_n = 2n + 7$	
3.2.1.	Calculate T_{100}	(1)
3.2.2.	Which term in the sequence has a value of 997?	(2)
3.2.3.	Is 153 a term in this sequence? Use basic algebra to prove your answer.	(3) [13]

QUESTION 4:

4.1. Solve for x

4.1.1.
$$-3(x+4) = 7x - (-x+3) + 2$$
 (3)

4.1.2.
$$x^2 - 49 = 0$$
 (2)

4.1.3.
$$\frac{x-3}{2} = \frac{6-x}{x}$$
, where $x \neq 0$. (4)

$$4.1.4. \quad 2 \cdot 5^{x-1} - 250 = 0 \tag{3}$$

4.1.5.
$$-4 \le x - 3 \le \frac{1}{2}$$
, where $x \in Z$. Represent your solution on a number line. (3)

4.2. Solve simultaneously for x and y:

$$\begin{aligned}
 x + 2y &= 17 \\
 2y &= 6x - 4
 \end{aligned}$$
(4)

4.3. Given the following equation:
$$s = ut + \frac{1}{2}at^2$$

4.3.2. Hence find the value of *a*, correct to TWO decimal places, if

$$s = 10,3$$

 $u = 3,4$
 $t = 5,7$ (2)

QUESTION 5: The diagram alongside shows the graph of $f(x) = x^2 - 9$ with x-intercepts A and B.

g(x) = mx + 6 is the line passing through A, F, G and D. q(x) is the line passing through E and F and is perpendicular to g(x) at F.



5.2. Calculate the value of m. (2)

5.3. Show that
$$q(x)$$
 has the equation $y = -\frac{1}{2}x + 1$ (4)

- 5.4. Hence determine the coordinates of F. (4)
- 5.5. Write down the range of f(x). (2)

[14]

QUESTION 6: You are given a hyperbola $h(x) = \frac{16}{x}$ and a parabola $p(x) = -\frac{1}{2}x^2 + 4$.

6.1. **ON THE DIAGRAM SHEET PROVIDED**, draw neat sketch graphs of h(x) and p(x).

Indicate the coordinates of all intercepts with the axes, the turning point of p(x), the asymptotes for h(x) and at least one point on h(x). It is in your interests to show your calculations on your answer sheet and to make sure that you <u>sketch in pencil</u>. (6)

- 6.2. Write down the domain of h(x). (1)
- 6.3. Calculate the value of h(4) p(4). (2)
- 6.4. <u>Use your diagram</u> to solve for *x*: p(x) > h(x). (1)

[10]

QUESTION 7: The diagram below represents the graph of the exponential function $t: y = 3^x$.



7.1. **ON THE DIAGRAM SHEET PROVIDED**, draw neat sketch graphs of

7.1.1.
$$r: y = \left(\frac{1}{3}\right)^x$$
 (2)

Note: On the same set of axes.

7.1.2.
$$k: y = -3^x$$
 (2)

In each case, clearly indicate the coordinates of any intercepts with the axes and the coordinates of the image of M (use the notation M' and M'' respectively).

7.2. Write down the equation of the new graph f(x) obtained if t(x) is shifted 3 units upwards. (1)

[5]

DIAGRAM SHEET FOR QUESTION 6.1.

Use scale: 1 block = 1 unit



DIAGRAM SHEET FOR QUESTION 7.1.

Use scale: 1 block = 1 unit

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y

	Momo	
$\frac{3}{3}x^2 - 48y^2 = 3(x^2 - 48y^2)$		/
$= 3 \left(n - 4y \left(n + 4y \right) \right)$	(3)	
$\frac{12}{2} \frac{14x^3y^2}{2} - 35xyz^2 + 7xy^4}{2x^2y - 5z + y^3}$	Z (2)	
13. 5a(x-y) - 3b(y-x) = 5a(x-y) + 3b(x-y) = (x-y)(5a+3b)	. (3)	
$\frac{1.4}{2\pi^2 + 3\pi - 5} = (2\pi + 5)(\pi - 1)$	(2)	
$15 \pi^{2}(x^{2}-64) - 25(x^{2}-64) = (x^{2}-64)(x^{2}-25) = (x-4)(x^{2}+4x+6)(x-5)$	(x+5) 4I (4)	
$21. (3x-y)(9x^{2}+3xy+y^{2}) = 27x^{3}-y^{3}$	(Z)	
2.2. $2\pi^{2} + \chi y - [(3\pi + 2y)(\pi + 4y)]$ = $2\pi^{2} + \chi y - [3\pi^{2} + 12\pi y + 2\chi y]$ = $2\pi^{2} + \chi y - 3\pi^{2} - 12\pi y - 2\pi$ = $-\pi^{2} - 13\pi y - 8y^{2}$.)] $y + 8 y^{2}$] $y - 8 y^{2}$ (4)	

72 7212 7-7 . ~
$\frac{22}{3} - \frac{2}{4} + \frac{1}{4}$
$= \frac{4(2x+3)}{12} - \frac{3(x-7)}{12} + \frac{12x}{12}$
$= \frac{8x + 12 - 3x + 21 + 12x}{12}$
$= \frac{17n + 33}{12}$ (3)
2.4. $\frac{3 \pi y^2 - 3 \pi z_{y}^2}{9 \pi - 9 y}$
$= \frac{3 \times y_{1}(y-x)}{9(x-y)}$
$= -\frac{3xy(x-y)}{9(x-y)}$
$= -\frac{\chi(y)}{3} \tag{4}$
2.5. $\frac{4\pi^2 - 1}{\pi + 5} \times \frac{\pi^2 + 11\pi + 30}{2\pi - 1} = \frac{\pi + 6}{2}$
$= \frac{(2x+1)(2x-1)}{(x+5)} \times \frac{(x+6)(x+5)}{(2x-1)} \times \frac{2}{(x+6)}$
= 2(2x+1)
$= 4\pi + 2$ (4)

$$2.b. \frac{(2n)^{3}}{(24(xy^{2})^{-3})} = \frac{8x^{3} \cdot 9 \cdot x^{2} \cdot y^{-4}}{24(xy^{2})^{-3}} = \frac{8x^{3} \cdot 9 \cdot x^{2} \cdot y^{-4}}{24 \cdot x^{-3} \cdot y^{-6}} = 3 \cdot x^{5+2-(-3)} \cdot y^{-4-(-6)} = 3 \cdot x^{5} \cdot y^{2} \qquad (4)$$

$$= 3 \cdot x^{5} \cdot y^{2} \qquad (5)$$

$$= 3 \cdot x^{5} \cdot y^{2} \quad (5)$$

$$= 3 \cdot x^{5} \cdot y^{2} \quad$$

$$5.2.3 \quad 153 = \frac{n}{4} - 5$$

$$158 = \frac{n}{4} \qquad 2n = 146$$

$$\Rightarrow 632 = n \qquad n = 13$$

$$n \in \mathbb{N} \quad \therefore \quad 153 \quad \text{is a ferm in}$$

$$fine \quad \text{fequence} \quad (3)$$

$$(13)$$

$$41.1 \quad -3(n+4) = 7x - (-x+3) + 2$$

$$-3x - 12 = 7x + x - 3 + 2$$

$$-3x - 8x = -3 + 2 + 12$$

$$-11x = 11$$

$$x = -1. \qquad (3)$$

4.1.2.
$$\chi^2 - 49 = 0$$

 $(\chi - 7)(\chi + 7) = 0$
 $\Rightarrow \chi = 7 \approx \chi = -7.$ (2)

$$\frac{4.13}{Z} = \frac{6-x}{x}$$

$$\pi (x-3) = 2(6-x)$$

$$\pi^{2}-3x = 12 - 2x$$

$$\pi^{2}-x - 12 = 0$$

$$(\pi + 3)(x - 4) = 0$$

$$\Rightarrow \pi = -3 \text{ or } \pi = +4.$$
 (4)

4.1.4
$$2 \cdot 5^{\chi - 1} - 250 = 0$$

 $2 \cdot 5^{\chi - 1} = 250$
 $5^{\chi - 1} = 125$
 $5^{\chi - 1} = 5^{3}$
 $\chi = 4$. ()

(3)

4.15.
$$-4 \le x - 3 \le \frac{1}{2}$$
, $x \in \mathbb{Z}$
 $-1 \ x \le \frac{3}{2}$, $x \in \mathbb{Z}$
 $\underbrace{-1 \ c \ 1 \ 2 \ 3}$
(3)
4.2. $x + \frac{2}{3} = 17$(3)
 $2y = 6x - 4$...(2)
(1): $x = 17 - 2y$
Substitute into (2):
 $2y = 6(17 - 2y) - 4$
 $2y = 102 - 12y - 4$
 $14y = 98$
 $y = 7$
 $\therefore x = 17 - 2(7)$
 $x = 3$. (4)
4.3.1 $S = ut + \frac{1}{2}at^{2}$
 $S - ut = \frac{1}{2}at^{2}$
 $\frac{S - ut}{t^{2}} = a$
 $\frac{1}{2}(S - ut) = a$
 $\frac{2}{t^{2}}$
(2)

4.32
$$\alpha = \frac{z(10,3 - (3,4)(5,7))}{(5,7)^2}$$

 $\alpha = -0,56$
 (73)

5.1.
$$f(x) = x^{2} - 9$$

 $0 = x^{2} - 9$
 $0 = (x - 3)(x + 3)$
 $\Rightarrow x = 3 \text{ or } x = -3$
i.e. $A(-3,0) B(3,0)$ (2)
5.2. $g(x) = mx + 6$
 $Svbshtute (G)(6):$
 $16 = m(5) + 6$
 $10 = 5m$
 $2 = m$ (2)
5.3 $q(x) \perp g(x)$
 $\Rightarrow (m_{q}) \cdot (2) = -1$.
 $m_{q} = -\frac{1}{2}$
 $q(x) = -\frac{1}{2} x + c$
 $Substitute (-6; 4):$
 $4 = 3 + c$
 $1 = c$
 $\therefore q(x) = -\frac{1}{2} x + 1$. (4)

.

54.A+F; g(x) = q(x)	
$2x+6 = -\frac{1}{2}x+1$ 4x+12 = -x+2 5x = -10 x = -2 $\Rightarrow y = 2(-2)+6$ y = 2	
:. F(-2;2).	+)
5.5. Range of $f(n)$: $y \ge -9$, yei [14] (3) 6.1. DIAGRAM SHEET. (1	R 2) 6)
6.2. Do main of $h(x) : x \in \mathbb{R}, x \neq 1$	D.
6.3. $h(4) - p(4)$ = $\frac{16}{4} - (-\frac{1}{2}(4)^2 + 4)$	')
= 4 - (-8 + 4) = 8 (3	Z)
6.4. $p(x) > h(x)$ for :	
$-4 < x < 0, x \in \mathbb{R}.$ (10) 1 7.1. DIAGRAM SHEET (L 7.2. $f(x) = 3^{x} + 3$. II	1) (+)
(5)	-

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DIAGRAM SHEET FOR QUESTION 6.1.



DIAGRAM SHEET FOR QUESTION 7.1.



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Paper 6 and Paper 7 May/June Algebra, Trig & Geometry (QI - Q4 + Q9: Algebra) (Q5 - Q7: Geometry and Trig) (Q8: Combined)



Grade 10 - Algebra, Trig and Geometry (Paper 1 and Paper 2) : June Exam Total: 150 <u>QUESTION 1</u>

1.1 Expand:
$$(2x+1)(3x^2-x-5)$$
 (4)

1.2 Simplify:
$$\frac{6^{x}.9^{x-1}.2}{18^{x+1}}$$
 (4)

1.3 Factorise:
$$x^3 - 8y^3$$
. (3)

1.4 Simplify:
$$\frac{3}{4x^2} + \frac{5}{2x}$$
 (3)

1.5 Simplify:
$$\frac{6ab - 2a - 4b + 3a^2}{10b + 5a} \div \frac{3a^2 + 7a - 6}{a^2 - 9}$$
(8)

QUESTION 2

2.1 Consider the number pattern: -4; 1; 6; 11; ...

2.1.2 Write down the n^{th} term in the form: $T_n = \dots$ (2)

2.2 Consider the number pattern: x-4; 2x-1; 3x+2; ...

2.2.1	Write down the next 2 terms in the sequence.	(2)
2.2.2	Write down the n^{th} term in the form: $T_n = \dots$	(3)
2.2.3	If the 20^{th} term in the sequence has a value of 153,	
	determine the value of \boldsymbol{x}	(4)

[15]

	2x + 3	3y = 12 and $x - y - 1 = 0$	(5) [23]	
3.2	Solve	the simultaneous equations:		
	3.1.6	$4^x = 72$ (Use trial and improvement and give your answer correct to 1 decimal place).	(2)	
	3.1.5	$\frac{x-2}{x+1} = \frac{x+1}{x-7}$	(4)	
	3.1.4	2x(x-1) + 3(x-1) = 0	(3)	
	3.1.3	$3x^2+5x-2=0$	(3)	
	3.1.2	$(3^x - 9)(5^x - 125) = 0$	(3)	
	3.1.1	$(x-2)^2=9$	(3)	
3.1	Solve the following equations:			

QUESTION 4

4.1	Solve for x :	$\frac{1}{2} = \frac{1}{2} + \frac{1}{2}$	(4)
		x w v	

4.2 Given $2-3x \ge x+4$, $x \in \Re$. Solve for x. (2)

Show your answer(s):-

- 4.2.1 on a number line, (2)
- 4.2.2 using interval notation. (2)

[10]

5.1 If $A = 64^{\circ}$ and $B = 37^{\circ}$, use a calculator to evaluate the following, correct to 2 decimal places:

5.1.1	$\sin(A+B)$	(2)
5.1.2	$\tan^2 A + \cos^2 A$	(2)

 $5.1.3 \quad \cosec2A \tag{2}$

5.2 No calculator may be used for this question.

5.2.1	Draw, and clearly label, the triangles or diagram used to evaluate		
	trigonometric ratios of the special angles: 30° ; 45° ; 60°		
	Use your diagrams/triangles to answer parts: $5.2.2 - 5.2.4$	(4)	
5.2.2	Evaluate: $\cos^2 30^\circ - \sin^2 30^\circ$	(2)	
5.2.3	Evaluate: $\frac{\cos 60^\circ . \sin 45^\circ . \tan 60^\circ}{\sin 30^\circ . \tan 30^\circ . \cos 45^\circ}$	(5)	

5.3 Solve for x, where
$$x < 90^{\circ}$$
: $2\cos(x - 20^{\circ}) = 1,14$ (3)

[20]

QUESTION 6

6.1 An aircraft can carry a total of 140 passengers in 2 class-configurations:
Economy and Business. Economy passengers are allocated 20kgs.
luggage, whilst Business Class are allowed 30kg each. If all passengers use their maximum weight allowance, the total combined weight of the luggage of all passengers is 3 040kg.

Calculate the number of passengers there are in Business Class. (5)

QUESTION 6 (cont.)

6.2 The diagram shows a plan-view of the layout of the runways at the airport.The aircraft will taxi along BC before lining up to take-off along CA.Calculate the length of runway (CA) available for take-off.



- 6.3 After take-off, the aircraft flies 1 000km from Cape Town to Bloemfontein.
 Due to a very strong southerly tail-wind, the out-going flight is at a speed of 200km/hr faster than the return journey. This results in a difference in flying-times of a quarter of an hour between the flight to Bloemfontein and the return to Cape Town. Calculate the speed travelled in each direction (7)
- 6.4 As the aircraft approaches the airport, at an altitude of 2000m, the instruments link with the navigation beacons at each end of the runway as seen in the diagram below. Calculate the length, BC, of the runway.



(5)

(4)

7.1

Below is the graph of the function: $f(x) = a \cdot \sin x$



7.2	What is the amplitude of the graph?	(1)

(2)

7.3 What is the minimum value of
$$f(x)$$
? (1)

7.4 Use the graph to determine the values(s) of x if
$$f(x) = -1$$
? (1)

7.5 What is the period of f(x)? (1)

<u>QUESTION 8</u> (Answer this question entirely on the supplied answer sheet).</u>

Please detach the ANSWER SHEET for this question, and once you have completed it, staple it to your package of answers-sheets.

On the attached ANSWER SHEET, you will find a grid containing nine sketched graphs of common Mathematical functions. Above each sketch-graph is a space in which to write the equation of that function.

You may choose from the list of functions supplied below.

This list contains all of the required functions, plus several extra functions, so make your choices carefully!

$y = 2\tan x - 1$	$y=2^x-2$	$y = \frac{1}{4}x^2 - 1$
$y = \left(\frac{1}{10}\right)^x - 1$	$y = 10^{-x} - 1$	$y = 2\sin x + 1$
$y = \frac{-1}{-1}$	$y = -2\sin x$	$y = 4^x - 1$
<i>x</i>	$y = -x^2 + 4$	$y = \tan x - 1$
$y = -2\cos x$ $y = -2x^2 + 2$	$y = -\frac{1}{x} + 2$	$y = \frac{2}{x} - 2$
	$y = 2\cos x + 1$	

(18) [**18**]

<u>QUESTION 9</u> (Answer this question entirely on the supplied answer sheet).</u>

ANSWER-SHEET

QUESTION 8

Name:....





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

- 9.1 Determine the co-ordinates of the intercepts of f(x) with both axes. Hence sketch f(x) on the axes above. (3)
- 9.2 Determine the co-ordinates of the intercepts of g(x) with both axes. (3)
- 9.3 Determine the points where f(x) and g(x) intersect. (4)

9.4Hence, sketch g(x) on the axes above.(3)9.5Write down the range of g(x)(2)

[15]

Memo

1.1 Expand: $(2x+1)(3x^2 - x - 5)$ = $6x^3 - 2x^2 - 10x + 3x^2 - x - 5$ = $6x^3 + x^2 - 11x - 5$

 $= 2^{x+1-x-1} \cdot 3^{x+2x-2-2x-2}$

$$\sqrt{\sqrt{\sqrt{\sqrt{100}}}}$$
 1 per term (4)

1.2 Simplify: $\frac{6^{x}.9^{x-1}.2}{18^{x+1}}$

$$=\frac{(2.3)^{x}.(3^{2})^{x-1}.2}{(2.3^{2})^{x+1}}$$
 \checkmark attempt to use bases of prime factors

 \checkmark attempt to gather powers of same base

$$= 2^{0} \cdot 3^{x-4} = 3^{x-4} = \frac{3^{x}}{81} \qquad \sqrt{\sqrt{a/a}}$$
(NB many variations in choice/order of steps acceptable) (4)

1.3 Factorise:
$$x^3 - 8y^3$$

 $= (x - 2y)(x^{2} + 2xy + 4y^{2})$ \$\sqrt{ 1st fact. \$\sqrt{ signs 2nd brack \$\sqrt{ terms 2nd brack } (3)\$}

1.4 Simplify: $\frac{3}{4x^2} + \frac{5}{2x}$ $= \frac{3+10x}{4x^2} \qquad \sqrt{\sqrt{\sqrt{}}} \quad aaa$ (3)
1.5 Simplify: $\frac{6ab-2a-4b+3a^2}{10b+5a} \div \frac{3a^2+7a-6}{a^2-9}$

 $=\frac{2b(3a-2)+a(3a-2)}{5(2b+a)}\times\frac{(a-3)(a+3)}{(3a-2)(a+3)} \quad \forall \quad \div \to \times \quad \sqrt{\text{start grouping}}$

$$=\frac{\overrightarrow{(3a-2)}(2b+a)}{5(2b+a)}\times\frac{(a-3)(a+3)}{(3a-2)(a+3)}\qquad \sqrt{\sqrt{\sqrt{\sqrt{\sqrt{4}}}}} \quad \text{4 expressions factorised}$$

$$=\frac{a-3}{5} \qquad \qquad \sqrt{\sqrt{num/den}} \tag{8}$$

[22]

2.1 Consider the number pattern: **-4**; **1**; **6**; **11**; ...

2.1.1 Write down the next 2 terms in the sequence.
16; 21; ...
$$\sqrt[n]{n}$$
 aa (2)
2.1.2 Write down the n^{th} term in the form: $T_n = \dots$
 $T_n = -4 + (n-1)5 = 5n - 9$ $\sqrt[n]{n}$ accept either version (2)
2.1.3 Which term in the sequence has a value of 451?
451 = 5n - 9 \Rightarrow 5n = 460
 $\therefore n = 92$ (2)

2.2 Consider the number pattern: x-4; 2x-1; 3x+2; ...

2.2.1 Write down the next 2 terms in the sequence.
...;
$$4x+5$$
; $5x+8$; ... $\sqrt{\sqrt{}}$ aa (2)
2.2.2 Write down the n^{th} term in the form: $T_n = \dots$
 $T_n = nx + (-4+3(n-1))$

$$T_n = nx + 3n - 7 \qquad \qquad \sqrt{\sqrt{\sqrt{}}} \quad aaa \qquad (3)$$

2.2.3 If the 20^{th} term in the sequence has a value of 153, determine the value of x

$T_n = nx + 3n - 7$	$\sqrt{\sqrt{1-1}}$ corr. substituti	on
$153 = 20x + 53$ $\Rightarrow x = 5$	\sqrt{m} \sqrt{a}	(4)
		[15]

3.1 Solve the following equations:

3.1.1
$$(x-2)^2 = 9$$

either: $(x-2) = \pm 3$ or: $x^2 - 4x + 4 - 9 = 0$ \sqrt{m}
 $\therefore x = 5$, or -1 $\therefore x^2 - 4x - 5 = 0$
 $(x-5)(x+1) = 0$
 $\therefore x = 5$, or -1 $\sqrt{a}\sqrt{a}$ (3)

3.1.2
$$(3^{x} - 9)(5^{x} - 125) = 0$$

either: $3^{x} = 9$ or: $5^{x} = 125$ \sqrt{m}
 $\therefore x = 2$ or $x = 3$ $\sqrt{a}\sqrt{a}$ (3)

3.1.3
$$3x^2 + 5x - 2 = 0$$

 $\therefore (3x - 1)(x + 2) = 0$ \sqrt{m}
 $\therefore x = \frac{1}{3}$ or $x = -2$ $\sqrt{a}\sqrt{a}$ (3)

3.1.4
$$2x(x-1)+3(x-1)=0$$

 $\therefore (x-1)(2x+3)=0$ \sqrt{m}
 $\therefore x=1 \text{ or } x=-\frac{2}{3}$ $\sqrt{a\sqrt{a}}$ (3)

3.1.5
$$\frac{x-2}{x+1} = \frac{x+1}{x-7}$$

 $\therefore \frac{(x-2)(x+1)(x-7)}{(x+1)} = \frac{(x+1)(x+1)(x-7)}{(x-7)}$ \sqrt{m}

∴
$$(x-2)(x-7) = (x+1)(x+1)$$
 \sqrt{m}

$$\therefore x^2 - 9x + 14 = x^2 + 2x + 1 \qquad \qquad \sqrt{m}$$

$$\therefore 13 = 11x \qquad \therefore x = \frac{13}{11} \qquad \qquad \sqrt{a} \qquad (4)$$

3.1.6 $4^x = 72$ (Use trial and improvement and give your answer correct to 1 decimal place).

$$x = 3,085 = 3,1$$
 (1 d.p) $\sqrt{a\sqrt{a}}$ (2)
3.2 Solve the simultaneous equations:

2x + 3y = 12 and x - y - 1 = 0

2x + 3y = 12 (1)

x - y = 1 (2)

either, (substitution):

or, (elimination):

(2)×2: 2x-2y=2 (3)

(1)-(3): 5y = 10

 $2x + 3y = 12 \quad (1)$

 $\therefore y = 2$ and x = 3

(2): x = 1 + ysub (2) into (1): 2(1+y) + 3y = 12 (3) (3): 2+2y+3y = 125y = 10

 $\therefore y = 2$ and x = 3

(NB many variations in above methods acceptable)

QUESTION 4

4.1 Solve for x: $\frac{1}{x} = \frac{1}{w} + \frac{1}{v}$ $\frac{1}{x} = \frac{v + w}{vw}$ $\sqrt{a \sqrt{a}}$ $x = \frac{vw}{v + w}$ $\sqrt{a \sqrt{a}}$ (4)

4.2 Given $2-3x \ge x+4$, $x \in \Re$. Solve for x.

Show your answer(s):-

4.2.1 on a number line,



4.2.2 using interval notation.

 $x \in (-\infty; -\frac{1}{2}]$, $x \in \Re$ $\sqrt{a \sqrt{a}}$ (2)

[10]

 \sqrt{m}

 \sqrt{m}

 \sqrt{m}

 $\sqrt{a}\sqrt{a}$

(5)

[23]

5.1.1

sin(A+B)

- 5.1 If $A = 64^{\circ}$ and $B = 37^{\circ}$, use a calculator to evaluate the following, correct to 2 decimal places:
 - $= \sin(64^\circ + 37^\circ) \qquad \qquad \sqrt{a} \qquad (2)$ $= \sin 101^\circ = 0.98 \qquad \qquad \sqrt{a}$
 - 5.1.2 $\tan^2 A + \cos^2 A$ = $\tan^2 64^\circ + \cos^2 64^\circ = 4,40$ $\sqrt{a}\sqrt{a}$ (2)
 - 5.1.3 cosec2A = $\frac{1}{\sin 128^{\circ}} = 1,27$ $\sqrt{a}\sqrt{a}$ (2)

5.2 No calculator may be used for this question.

5.2.1 Draw, and clearly label, the triangles or diagram used to evaluate trigonometric ratios of the special angles: 30°; 45°; 60° Use your diagrams/triangles to answer parts: 5.2.2 – 5.2.4



 $\sqrt{a}\sqrt{a}\sqrt{a}\sqrt{a}$ (4)

5.2.2 Evaluate: $\cos^2 30^{\circ} - \sin^2 30^{\circ}$

 $= \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 \qquad \qquad \sqrt{m}$ $= \frac{3}{4} - \frac{1}{4} = \frac{1}{2} \qquad \qquad \sqrt{a} \qquad (2)$

5.2.3 Evaluate:
$$\frac{\cos 60^\circ \cdot \sin 45^\circ \cdot \tan 60^\circ}{\sin 30^\circ \cdot \tan 30^\circ \cdot \cos 45^\circ}$$

$$=\frac{\frac{1}{2}\cdot\frac{1}{\sqrt{2}}\cdot\frac{\sqrt{3}}{1}}{\frac{1}{2}\cdot\frac{1}{\sqrt{3}}\cdot\frac{1}{\sqrt{2}}} = \frac{\sqrt{3}}{1}\times\frac{\sqrt{3}}{1} = 3 \qquad \qquad \sqrt{a}\sqrt{a}\sqrt{a}\sqrt{a}\sqrt{a} \qquad (5)$$

5.3 Solve for x, where
$$x < 90^{\circ}$$
: $2\cos(x-20^{\circ}) = 1,14$

$$\cos(x-20^\circ)=0,57\qquad \qquad \sqrt{m}$$

$$\therefore x - 20^\circ = 55,25^\circ \qquad \qquad \sqrt{a}$$

$$\therefore x = 75,25^{\circ} \qquad \qquad \sqrt{a} \qquad (3)$$

[20]

QUESTION 6

6.1 An aircraft can carry a total of 140 passengers in 2 class-configurations:
Economy and Business. Economy passengers are allocated 20kgs.
luggage, whilst Business Class are allowed 30kg each. If all passengers use their maximum weight allowance, the total combined weight of the luggage of all passengers is 3 040kg.

Calculate the number of passengers there are in Business Class.

	Economy	Business
Allowance	20kg	30kg
No. of passengers	x	140-x \sqrt{a}
Luggage wt.	$20x \qquad \sqrt{a}$	$30(140-x) \qquad \sqrt{a}$

20x + 4200 - 30x = 3040

$$\therefore 1160 = 10x$$
$$\therefore x = 116 \qquad \qquad \sqrt{a} \qquad (5)$$

QUESTION 6 (cont.)

6.3 After take-off, the aircraft flies 1 000km from Cape Town to Bloemfontein. Due to a very strong southerly tail-wind, the out-going flight is at a speed of 200km/hr faster than the return journey. This results in a difference in flying-times of a quarter of an hour between the flight to Bloemfontein and the return to Cape Town. Calculate the speed travelled in each direction

 $\therefore AC = 4088, 27m$

(4)

	CT-Bloem -out	Bloem-CT - return	<u>n</u>
Speed	$x \text{ kmh}^{-1}$	$x - 200 \text{ kmh}^{-1}$	√a
Time	$\frac{1000}{x}$ \sqrt{a}	$\frac{1000}{x-200}$	√a
$\frac{1000}{x-200} - \frac{1000}{x} =$	$\frac{1}{4}$	\sqrt{a}	
$\frac{1000 \times 4x (x - 200)}{(x - 200)} - \frac{1000 \times 4x (x - 200)}{(x - $	$\frac{1000 \times 4 \cancel{x} (x - 200)}{\cancel{x}} = \frac{1 \times \cancel{4} x (x - 200)}{\cancel{4}}$	$\frac{-200}{\sqrt{m}}$	
∴ <u>4000x</u> <u>-4000x</u> +8000	$000 = x^2 - 200x$		
$\therefore x^2 - 200x - 800000 = 0$	0		
(x+800)(x-1000) = 0	0	\sqrt{m}	
$\therefore x = 1000 \text{ kmh}^{-1}$ out a	nd 800 kmh ⁻¹ return	\sqrt{a}	(7)

6.4 As the aircraft approaches the airport, at an altitude of 2000m, the instruments link with the navigation beacons at each end of the runway as seen in the diagram below. Calculate the length, BC, of the runway.



Below is the graph of the function: $f(x) = a \cdot \sin x$



7.1 Determine the value of a.

at (30°;1):
$$1 = a \sin 30^{\circ}$$
 \sqrt{m}
 $\therefore a = 2$ \sqrt{a} (2)

7.2	What is the amplitude of the graph?		
	amplitude = 2 (accept: a or ans 7.1)	\sqrt{a}	(1)
7.3	What is the minimum value of $f(x)$?		
	amplitude = -2 (accept: $-a$ or $-ans$ 7.1)	\sqrt{a}	(1)
7.4	Use the graph to determine the values(s) of x if $f(x) = -1$?		
	210° and 330°	\sqrt{a}	(1)
7.5	What is the period of $f(x)$?		
	360°	\sqrt{a}	(1)

[6]

<u>QUESTION 8</u> (Answer this question entirely on the supplied answer sheet).</u>

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You may choose from the list of functions supplied below.

<u>This list contains all of the required functions, plus several extra functions</u>, so make your choices carefully!

$y = 2\tan x - 1$	$y=2^x-2$	$y = \frac{1}{4}x^2 - 1$
$y = \left(\frac{1}{10}\right)^x - 1$	$y = 10^{-x} - 1$	$y = 2\sin x + 1$
$y = \frac{-1}{-1}$	$y = -2\sin x$	$y = 4^x - 1$
x	$y = -x^2 + 4$	$y = \tan x - 1$
$y = -2\cos x$	1 - 1 - 2	2
$y = -2x^2 + 2$	$y = -\frac{1}{x} + 2$	$y = \frac{x}{x}$
	$y = 2\cos x + 1$	

 $\sqrt{a}\sqrt{a}$ each

(18) [**18**]





9.1 Determine the co-ordinates of the intercepts of f(x) with both axes. Hence sketch f(x) on the axes above.

$$y - \text{int}: x = 0 \quad \therefore y = -1 \quad (0; -1) \qquad \sqrt{a}$$

$$x - \text{int}: y = 0 \quad \therefore 0 = \frac{1}{4}x^{2} - 1$$

$$1 = \frac{1}{4}x^{2} \quad \therefore x^{2} = 4 \quad (-2; 0) \quad \& \quad (2; 0) \qquad \sqrt{a} \quad \sqrt{a} \quad (3)$$

9.2 Determine the co-ordinates of the intercepts of g(x) with both axes.

$$y - \operatorname{int} : x = 0 \quad \therefore y = 2 \qquad (0;2) \qquad \qquad \sqrt{a}$$
$$x - \operatorname{int} : y = 0 \quad \therefore 0 = x + 2 \quad \therefore x = -2 \quad (-2;0) \qquad \qquad \sqrt{a} \sqrt{a} \qquad (3)$$

9.3 Determine the points where f(x) and g(x) intersect.

9.4

$$f = g \quad \frac{1}{4}x^2 - 1 = x + 2 \qquad \qquad \sqrt{m}$$

$$\therefore x^2 - 4 = 4x + 8 \text{ and so } \therefore x^2 - 4x - 12 = 0$$

$$\therefore (x - 6)(x + 2) = 0 \qquad \therefore x = 6 \text{ and } x = -2 \qquad \qquad \sqrt{a}$$

Pts of intersection: (6;8) and (-2;0)
$$\qquad \sqrt{a} \sqrt{a} \sqrt{a} \qquad (4)$$

Hence, sketch $g(x)$ on the axes above.
$$\qquad \sqrt{a} \sqrt{a} \sqrt{a} \qquad (3)$$

9.5 Write down the range of g(x)

 $y \in \Re$ either: $y \ge -1$ or: $y \in [-1;\infty)$ $\sqrt{a} \sqrt{a}$ (2)

[15]



Paper 8 Oct/Nov Algebra



Grade 10 - Algebra (Paper 1) November (End of year Exam) Total: 100 Time: 120min

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 $0,\dot{2}\dot{4}\dot{5}$ 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:

$$6q + 7p = 3$$

$$2q + p = 5$$
[13]

3.1	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 mul Determi	Itiples of three form the number pattern: 3 ; 6 ; 9 ; 12 ; ne the 13^{th} 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.
- 4.2 The following advertisement appeared with regard to buying a bicycle on a hirepurchase agreement loan:

Purchase price	R5 999	
Required deposit	R600	
Loan term	Only 18 months, at 8% p.a. simple interest	

- 4.2.1 Calculate the monthly amount that a person has to budget for in order to pay for the bicycle.
- 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]

(3)

(6)

5.1

	5.1.1	A	(1)
	5.1.2		(1)
5.2	State whi	ch of the following sets of events is mutually exclusive:	
	А	Event 1: The learners in Grade 10 in the swimming team Event 2: The learners in Grade 10 in the debating team	
	В	Event 1: The learners in Grade 8 Event 2: The learners in Grade 12	
	С	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 lea 18 le 4 lea All 4 	rners are left-handed earners play soccer rners play soccer and are left-handed 0 learners are either right-handed or left-handed	
	Let L be soccer.	the set of all left-handed people and S be the set of all learners who play	
	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]

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

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 <i>f</i> .	(2)
6.4	Solve for x if $f(x) = g(x)$.	(5)
6.5	Determine the values of x for which $-1 \le g(x) < 3$.	(3)
6.6	Determine the <i>y</i> -intercept of <i>k</i> 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.



- 7.1Write 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.
- 7.5 Determine the equation of an exponential function, $g(x) = b^x + q$, with range y > -4and which passes through the point A. (3)

[10]

(2)

TOTAL: 100

Memo

1.1.1	$(m-2n)(m^{2}-6mn-n^{2})$ = $m^{3}-6m^{2}n-mn^{2}-2m^{2}n+12mn^{2}+2n^{3}$ = $m^{3}-8m^{2}n+11mn^{2}+2n^{3}$	✓ expansion ✓ m^3 ; $+2n^3$ ✓ $-8m^2n+11mn^2$	(3)
1.1.2	$\frac{x^{3}+1}{x^{2}-x+1} - \frac{4x^{2}-3x-1}{4x+1}$ = $\frac{(x+1)(x^{2}-x+1)}{x^{2}-x+1} - \frac{(4x+1)(x-1)}{4x+1}$ = $x+1-(x-1)$ = 2	$\checkmark \checkmark (x+1)(x^2 - x + 1)$ $\checkmark (4x+1)(x-1)$ $\checkmark x+1-(x-1)$ $\checkmark \text{ answer}$	(5)
1.2.1	$6x^{2} - 7x - 20$ = (3x + 4)(2x - 5)	$\checkmark (3x+4) \\ \checkmark (2x-5)$	(2)
1.2.2	$a^{2} + a - 2ab - 2b$ = $a(a + 1) - 2b(a + 1)$ = $(a + 1)(a - 2b)$	✓ grouping ✓ $(1 + a)$ ✓ $(a - 2b)$	(3)
1.3	Since $7^2 = 49$ and $8^2 = 64$ and 49 < 51 < 64, $7 < \sqrt{51} < 8$ i.e. $\sqrt{51}$ lies between 7 and 8	✓ 49 < 51 < 64 ✓ answer	(2)
1.4	Let $x = 0, \dot{2}\dot{4}\dot{5}$ Then $1000x = 245, \dot{2}\dot{4}\dot{5}$ i.e. $999x = 245$ i.e. $x = \frac{245}{999}$ Therefore <i>x</i> is a rational number.	✓ introduce variable ✓ 1000x = 245,245 ✓ 999x = 245 ✓ x = $\frac{245}{999}$	(4) [19]

2.1.1	$x^2 - 4x = 21$	
	$x^2 - 4x - 21 = 0$	\checkmark standard form
	(x+3)(x-7) = 0	✓ factors
	x + 3 = 0 or $x - 7 = 0$	✓ answers
	$x = -3 \qquad \qquad x = 7$	
		(3)
2.1.2	$\frac{5}{4}$	5
	$96 = 3x^4$	$\checkmark 32 = x^{\frac{3}{4}}$
	$32 - r^{\frac{5}{4}}$	$\checkmark x = (32)^{\frac{4}{5}}$
	$52 - \chi$	
	$x = (32)^5$	
	$=(2^5)^{\frac{4}{5}}$	
	$=2^{4}$	
	=16	✓ answer
		(3)
2.1.3	$R = \frac{2\sqrt{x}}{2\sqrt{x}}$	V Multiply by 25 and
	35	divide by 2
	$\frac{3RS}{2} = \sqrt{x}$	✓ Squaring both sides
	2 $9R^2S^2$	(2)
	$x = \frac{3773}{4}$	(-)
2.2	6q + 7p = 3Equation 1	
	2q + p = 5Equation 2	
	6q + 7p = 3Equation 1	
	14q + 7p = 35Equation 3	$\checkmark 14q + 7p = 35$
	Equation 3 – Equation 1:	1 · r
		$\checkmark 8q = 32$
	$\delta q = 52$	$\checkmark q = 4$
	q = 4	\checkmark substitution
	2(4) + p = 5	$\checkmark p = -3$
	p = -3	(5)
		[13]
1		

3.1.1	10;6;2			✓ 10
				√ 6
				✓ 2
				(3)
3.1.2	d = -4			$\checkmark -4 n$
				✓ 14
	$\mathbf{T}_n = -4n + 14$			(2)
3.1.3	-4n+14 < -31			$\checkmark -4n + 14 < -31$
	-4n < -45			✓ <i>n</i> >11,25
				✓ answer
	<i>n</i> > 11,25			(3)
	<i>n</i> = 12			
3.2	$T_n = 6n$		$T_n = 3n$	$\checkmark 6n$
	$T_{12} = 6(13)$	OR	$T_{26} = 3(26)$	\checkmark substitution of 13
	70	0	-20 -20	✓ answer
	= /8		= /8	(3)
				OR
				$\checkmark 3n$
				\checkmark substitution of 26
				✓ answer
				(3)
				[11]

4.1	$A = P(1+i)^{n}$ = 4500 $\left(1 + \frac{4.25}{100}\right)^{2.5}$	✓ $n = 2.5$ ✓ substitution ✓ answer
	=R 4993.47	(3)
4.2.1	Loan amount = $R5 999 - R600$ = $R5 399$	$\checkmark y = 0$
	Total amount owed = 5 399[1+(0,08)(1,5)] = R6 046,88 Monthly instalment = $\frac{6046.88}{18}$ = R335,94	 ✓ 5 399 ✓ n = 1,5 ✓ Substitution ✓ R6 046,88 ✓ ÷ 18 ✓ R335,94
4.2.2	R6 046,88 - R5 399 = R647,88	\checkmark answer (1)
4.3	$1 \text{ kg} = 1 \ 000 \text{ g}$ $\frac{1000}{28,35} = 35,27336861 \text{ ounces}$ $35,27336861 \text{ x } 978,34 \text{ x } 8,79$ $= \text{R}303 \ 337,16$	 ✓ conversion ✓ division ✓ multiplication ✓ answer (4) [14]

5.1.1	$A \cap B$ OR A and B	✓ answer	(1)
5.1.2	$\mathbf{A}' \mathbf{OR} \operatorname{not} \mathbf{A}$	✓ answer	(1)
5.2	В	✓ answer	(1)
5.3.1	19 learners are right-handed and do not play soccer.	✓ answer	(1)
5.3.2	$\begin{bmatrix} S \\ 14 \\ 4 \\ \end{bmatrix}$	✓ 15 ✓ 4 ✓ 2 ✓ 19	(4)
5.3.3 (a)	$P(L \text{ OR S}) = \frac{14 + 4 + 3}{40}$ 21	$\checkmark 15 + 4 + 2$ $\checkmark 40$ $\checkmark \text{ answer}$	
	$=\frac{1}{40}$		(3)
5.3.3 (b)	$P(R \text{ AND } S) = \frac{14}{40}$ $= \frac{7}{20}$	✓ $\frac{15}{40}$ ✓ answer	
	20		(2) [13]



7.1	C(-2;0)	✓ answer
		(1)
7.2	$f(x) = ax^2 + q$	
	$f(x) = a(x^{2} - 4)$ $25 = a((-3)^{2} - 4)$	$\checkmark f(x) = a \left(x^2 - 16 \right)$
	2,5 = 5a 1	✓ substitution of $(-5; 2,25)$
	$a = \frac{1}{2}$ $f(x) = \frac{1}{2} \left(x^2 - 4 \right)$	✓ answer
	$\int (x) - \frac{1}{2} (x - 4)$	(3)
7.3	Range of f : $[-2;\infty)$	\checkmark answer (1)
7.4	Range of h : $(-\infty; 0]$	 ✓ notation ✓ critical values (2)
7.5	$g(x) = b^{x} - 4$ $0 = b^{2} - 4$ $4 = b^{2}$ b = 2 $g(x) = 2^{x} - 4$	✓ $g(x) = b^x - 4$ ✓ substitution
		✓ answer (3) [10]

TOTAL: 100



Paper 9 Oct/Nov Algebra



Grade 10 - Algebra (Paper 1) November (End of year Exam) Total: 100 Time: 120min

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]

2.1 Solve for x :		<i>x</i> :	
	2.1.1	x(x-1) = 20	(4)
	2.1.2	$\frac{3x-2}{2} = x+1$	(3)
2.2	Given:	$4 \le -\frac{1}{2}m < 5$ where $m \in R$	
	2.2.1	Solve for <i>m</i> .	(3)
	2.2.2	Write the answer to QUESTION 2.2.1 in interval notation.	(1)
2.3	Given: 4x	$x^{2} - y^{2} = 171$ 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]

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.



3.6	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]
3.5	Which pattern will have exactly 64 light floor tiles?	(3)
3.4	Write down the general term (L_n) for the number of light floor tiles used in each pattern.	(2)
3.3	Write down the general term (D_n) for the number of dark floor tiles used in each pattern.	(2)
3.2	How many light tiles were used in pattern 6?	(1)
3.1	How many dark tiles were used in pattern 5?	(1)

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.	ne loan that Mary will take. (2)
--	----------------------------------

- 4.1.2 Calculate the total amount that must be repaid on the hire-purchase agreement.
- 4.1.3 Calculate the monthly repayment, which includes the monthly insurance premium.
- 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**]

(3)

(3)

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 || *x*-axis. *f* and *g* intersect at A and E.



5.7	Calculate	the length of AK.	(4) [18]
	5.6.2	$f(x).g(x) \ge 0$	(2)
	5.6.1	f(x) < g(x)	(2)
5.6	6 For which values of x will:		
5.5	Determine the coordinates of E, a point of intersection of f and g .		(4)
5.4	Calculate	the coordinates of B.	(3)
5.3	Determine	e the length of CD.	(1)
5.2	Write dov	wn the coordinates of D.	(1)
5.1	Write down the coordinates of C. (1		(1)

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



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

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]

8.3

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.

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

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)
8.3.1	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.	
	Calculate P (A or B).	(3) [12]

TOTAL: 100

(2)

(2)

Memo

QUES	TION 1/VRAAG 1	
1.1.1	$x^2 - x$	
	=x(x-1)	✓ answer/antwoord
1.1.2	$3x^2 + 3px - 2mx - 2mp$	(1)
	=3x(x+p)-2m(x+p)	$\checkmark 3x(x+p) \checkmark -2m(x+p)$
	=(3x-2m)(x+p)	✓ answer/antwoord
	OR/OF	(3)
	$3x^2 - 2mx + 3px - 2mp$	
	=x(3x-2m)+p(3x-2m)	$\checkmark x(3x-2m) \checkmark p(3x-2m)$
	=(3x-2m)(x+p)	✓ answer/antwoord
1.1.3	$2p^2 - 2p - 12$	(3)
	$=2(p^2-p-6)$	✓ taking out com. fact
	=2(p-3)(p+2)	correctly/korrek gem. faktors ✓✓ answer/antwoord
	OR/OF	(3)
	$2p^2 - 2p - 12$	$\checkmark \checkmark$ factors/gem faktors
	=(2p-6)(p+2)	✓ answer/antwoord
	=2(p-3)(p+2)	(3) CA apply for maximum of 2 marks
		DA-maksimum van 2 punte
		Answer ONLY full marks Antwoord ALLEENLIK-vol punte
		_

1.2.1	$\frac{\frac{2^{a+1} - 2^{a-1}}{2^{a}}}{=\frac{2^{a}(2 - 2^{-1})}{2^{a}}}$ $= 2 - \frac{1}{2}$	\checkmark com. fact/gem. fak $\checkmark (2-2^{-1})$
1.2.2	$\frac{x^{2} - x + 1}{x^{3} + 1} \div \frac{2x}{2x + 2}$	✓ answer/antwoord (3)
	$=\frac{x^{2}-x+1}{(x+1)(x^{2}-x+1)} \times \frac{2(x+1)}{2x}$ $=\frac{1}{x}$	 ✓ fact.of cube/fak van vierkant ✓ invert and multiply /inv. en maal ✓ factorise/ fak. 2(x + 1) ✓ answer/antwoord (4)

QUEST	TION 2/VRAAG 2	
2.1.1	x(x-1) = 20 $x^{2} - x - 20 = 0$ (x - 5)(x + 4) = 0 x = 5 or/of x = -4	 ✓ removing brackets/verw.hakkies ✓ stand.form/stand. vorm ✓ fact/fak ✓ answer/antwoord
2.1.2	$\frac{3x-2}{2} = (x+1)$ 3x-2 = 2(x+1) 3x-2 = 2x+2 x = 4 OR/OF 3x-2 = (x+1) = 0	(4) ✓ multipl./maal ✓ simpl/simp. ✓ answer/antwoord (3)
	$\frac{3x-2-2(x+1) = 0}{2} = 0$ $\frac{3x-2-2x-2}{2} = 0$ $\frac{x-4}{2} = 0$ $x = 4$	 ✓ writing the LHS as a single fraction./ skryf LK as n enkel breuk ✓ simplification/ simpl.
	OR/ <i>0F</i>	✓answer/antwoord (3)
	$\frac{3x}{2} - 1 = x + 1$ $\frac{3x}{2} - x = 2$ $\frac{x}{2} = 2$ $x = 4$	

2.2.1	$-4 \le -\frac{1}{m} < 5$	
	$2 - 8 \le -m < 10$	1 multipl/maal br 2
1	$8 \ge m > -10$	Critical values/krit augende
	$-10 < m \le 8$	✓ corr.notat/korr. not.
	OR/OF	(3)
	$-4 \le -\frac{1}{2}m \text{ and }/en -\frac{1}{2}m < 5$ $-8 \le -m \text{ and }/en -m < 10$ $-10 < m \le 8$	✓ multipl/maal by 2 ✓ m – values/waardes ✓ corr notat./korr. not
		(3)
2.2.2	(-10;8]	✓ ans/ant
231	Circula	(1)
and it is	$4x^2 = y^2 = 171$	
	2x - y = 9	
	(2x-y)(2x+y) = 171	
	9(2x + y) = 171	✓ factors/fak
	2x + y = 19	✓ answer/ant
2.3.2	2x - y = 9	(2)
	2x + y = 19	V method/method
	4x = 28	· memod/memode
	x = 7	
	<i>y</i> = 5	✓ x -value/waarde ✓ y - value/waarde
	OR/OF	(3)
	2x - y = 9	
	y = 2x - 9	
	2x + y = 19	✓ method/methode
	2x - (2x - 9) = 19	
	4x = 28	
	<i>x</i> = 7	Y r-value/war d-
	y = 5	\checkmark y - value/waarde
		(3)

√ans/ant
√ ans/ <i>ant</i> (1)
$\begin{array}{c} \checkmark 2n \\ \checkmark -2 \end{array} $ (1)
(2) √√ans/ant
(2) \checkmark equating/vergelyk $L_n = 64$ \checkmark factors/faktore \checkmark answer/antwoord (3)
✓√10 000 dark tiles/donker teëls ✓ans/ant (3)

QUEST	TION 4/VRAAG 4	
4.1.1	The cash deposit/Kontantdeposito = $0,15 \times R15550$	
	= R 2332,50	✓ deposit/deposito
	The value of loan/Waarde van lening $= R15550 - R233250$	
	= R13217,50	√ans/ant
	OR/OF	(2)
	The value of loan/Waarde van lening = 85% of 15550	✓ 85% of loan/85% van lening
	= R13217,50	✓ ans/ant
4.1.2	A = P(1 + i.n)	$\checkmark A = P(1+i.n) \tag{2}$
	$= 13217,50 \left(1 + 0,1625 \times \frac{54}{12} \right)$	✓ correct sub into correct formula/vervang in korrek
	= R22 882,80	formule. ✓ ans/ant
	OR/ OF	(3)
	SI = Pi.n	
	=13217,50(0,1625)(4,5)	
	= R9665,30	\checkmark SI = R9665,30.
	A = SI + P	
	= R9665,30 + R13217,50	$\bullet A = Pin + P$
	= R22882,80	✓ans/ant
4.1.3	Annual Insurance premium/Per jaar versekeringspremie = 0.015×15550	(3)
	= R 233.25 per annum/nor incr	dimetal i
ļ	Monthly payments/ Moord-1:1	Month/pagiement per magned
	22882.80 233.25	✓ insurance per
	$=\frac{22332,30}{54}+\frac{233,23}{12}$	month/versekering per maand
	= R 443.19	✓ ans/ant
	OR/ <i>OF</i>	(3)
	<i>AIP</i> = 233,25 × 4,5	✓ insurance for/versekering vir
	= <i>R</i> 1049,63	4,5 years/ jaar
	Monthly payments/ Maandelikse paaiement	✓ Instalment per month
	$=\frac{22882,80+1049,63}{54}$	/paaiement per maand
	= R 443,19	(3)

 \mathcal{D}

4.2.1	\$1 = R 13,45 \$x = R4 800 4800	
	$\$x = \frac{1000}{13,45}$	✓ division by/ deel deur 13,45
	=\$356,88	✓ answer/ antwoord (2)
4.2.2	\$1=R 13,45 \$85=R 1143,25 $1\pounds=21,41$ $\pounds x=R1143,25$ $x\pounds = \frac{1143,25}{21,41}$	✓1143.25 ✓ 1£ = 21,41
	$= \pm 53,40$	\checkmark ans/ant (3)
	OR/ <i>OF</i>	(3)
	$x\pounds = \frac{13,45}{21,41} \times 85$ = £ 53,40 OR / <i>OF</i>	$\checkmark \frac{13,45}{21,41} \checkmark \times 85$ $\checkmark \text{ans/ant} $ (3)
	$x\pounds = \frac{21,41}{13,45} \times 85$ = £ 53,40	$\checkmark \frac{21.41}{13.45} \checkmark \times 85$ $\checkmark \text{ans/ant}$
4.3	A = P(1+i)''	(3)
	$2P = P(1+i)^{5}$	$\checkmark 2P = P(1+i)^5$
	$2 = (1 + i)^{5}$	
	$\sqrt[3]{2} = 1 + i$ $i = \sqrt[3]{2} - 1$	$\checkmark \sqrt[6]{2} = 1 + i$
	$i = 0,148698 \times 100$ r = 14,87% p.a/per jaar	✓ $r = 14,87\%$ p.a /pj
		(3) [16]

i.

QUES	STION 5/ VRAAG 5	
5.1	C(0;-4)	√ans/ant
50		(1)
5.2	D(0;2)	\checkmark ans/ant (1)
5.3	CD = 2 - (-4)	(1)
	CD = 6 units/eenhede	
		✓ ans/ant
5.4	$x^2 - 4 = 0$	(1)
	(x-2)(x+2)=0	$\sqrt{factors/factore}$
	x = 2 $x = -2$	incloisijaniore
	B(-2:0)	
		✓ ans/ <i>ant</i>
5.5	$x^2 - 4 = -x + 2$	(3)
	$r^{2} + r = 6 - 0$	$\bigvee f(x) = g(x)$: equating/vergelyk
	(x + x - 0 = 0)	√ factors/faktore
	(x-2)(x+3)=0	raciois/janiore
	$\begin{array}{c} x=2 x=-3 \\ F(2)=0 \end{array}$	✓x-answer/antwoord
	E(-3; 5)	√y-answer/antwoord
5.6.1	-3 <x<2< td=""><td>(4)</td></x<2<>	(4)
		 ✓ values/waardes ✓ notation/notasis
	OR/OF	(2)
	(-3;2)	
5.6.2		
	$x \le -2$ or $x = 2$	1 - 2 / 2
		$\mathbf{v} x \leq -2 \mathbf{v} 2$
	OR/OF	
	$(-\infty, -2)$, (2)	
	$(-\infty, -2] \cup \{2\}$	$\checkmark (-\infty; -2] \checkmark 2$
.7	K(-2:4)	(2)
	BK = 4 units/eenhede	
	AB = 4 units/eenhede	\checkmark BK
	$AK = \sqrt{4^2 + 4^2} (Pythagoras)$	
	= 5,66 or $\sqrt{32}$ or $4\sqrt{2}$ units/eenhode	 method/methode method/methode
		· answer/aniwoora
		(4)

QUEST	ION 6/VRAAG 6	
6.1	<i>y</i> < 8	✓ answer/antwoord
6.2	$ \begin{array}{c} -2^{x} + 8 = 0 \\ 2^{x} = 8 \\ 2^{x} = 2^{3} \end{array} $	 ✓ equating to 0/vergelyk met 0 ✓ simpli/vereenv.
6.3	$ x = 3 B(3; 0) h(x) = 2^{x} - 8 $	$\checkmark x\text{-answer/antwoord} $ (3) $\checkmark \checkmark \text{ answer/antwoord}$
6.4	Reflecting the graph of g over the x-axis only changes the sign of the y-values. This means that both g and h will have the same x-intercept at B. Grafiek g oor die x-as gereflekteer om h te vorm. As y = 0, sal die oplossing dieselfde wees vir albei funksies. Beide g en h sal n x-afsnit by B hê.	(2) ✓ reflection over x-axis/reflek oor x-as ✓ explanation/verduideliking (2) [8]

Ū.

QUESTION 7/VRAAG 7		
$h(x) = \frac{a}{x} + 3$	√+3	
$0 = \frac{a}{2} + 3$ $a = -6$ $h(x) = \frac{-6}{x} + 3$	 ✓ subst. of/ sub van (2; 0) ✓ value of a/ waarde van a ✓ answer/antwoord 	
	(4)	
QUE	STION 8/VRAAG 8	
----------	---	-------------------------
8.1.1	27 - x + x + 32 - x + 7 = 42	doguetient 12
	-x = 42 - 66	• equation/vergelyking
	x = 24	
		✓answer/antwoord
8.1.2	(a) P(does not play hockey or soccer/machine to the	
	sokker)	
	$=\frac{7}{1}$	
	42	
	OR/OF	
	$=\frac{1}{c}$	
	6	✓answer/antwoord
5.1.2 (1	P(soccer only/slegs sokker)	
	$=\frac{\delta}{42}$	
	OR 42	✓✓ answer/antwoord
	4	
	$=\frac{1}{21}$	
	OR/OF	
	P(soccer only/slegs sokker)	
	$=1-\left(\frac{3+24+7}{2}\right)$	
	$=\frac{8}{100}$	
	42	√√answer/antwoord
	$=\frac{4}{21}$	(2
2.1	<u> </u>	
		✓ answer/antwoord
		(1)
.2	$P(blue/blou) = \frac{3}{3}$	
	x+3	√ answer/antwoord
1	P(A crit/ D) c	(2)
1	I(A and/en B) = 0	✓ answer/antwoord
		(1)
2	P(B) = 1 - P(B')	
	=1-0.7	
	= 0,3	-
	P(A or/of B) = P(A) + P(B)	$\checkmark P(B) = 0.3$
	$=0.55\pm0.2$	
	- 0,55 + 0,5	✓ subst./vervang
	- 0,00	✓ answer/antwoord
		(3)



Paper 10 Oct/Nov Algebra



Grade 10 - Algebra (Paper 1) November (End of year Exam) Total: 100 Time: 120min

Factorise the following expressions fully:

Simplify the following expressions fully:

 $6x^2y - 10xy + 15x - 25$

 $x^4 - 81$

QUESTION 1

1.1.1

1.1.2

1.1

1.2

	1.2.1	$\frac{3}{a-4} + \frac{2}{a+3} - \frac{21}{a^2 - a - 12}$	(5)
	1.2.2	$\frac{10^{2x+3}.4^{1-x}}{25^{2+x}}$	(4)
1.3	Conside	The following numbers: $\sqrt{27}$; $\sqrt[3]{-27}$; $\sqrt{-27}$.	
	Which (DNE of these numbers is:	
	1.3.1	Irrational	(1)
	1.3.2	Non-real	(1)
			[16]
QUES	STION 2		
2.1	Solve fo	r <i>x</i> :	
:	2.1.1	$15x^2 - 8 = 14x$	(4)
	2.1.2	$5^x = \frac{1}{125}$	(2)
2.2	The foll	owing 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 ga	ve one third of her money to Nazeem and one fifth of her money to	o Elwethu.

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]

(2)

(3)

L	Given the	mical number patient. 0, 5, 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)

3.1 Given the linear number pattern: 8; 3; -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 $0; -6; -20; -42 \dots$ 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]

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.



Given: f(x) = ax² + c f passes through the x-axis at (d-5) and (d-1), where d ∈ 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)

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.

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

SOUTH AFRICAN RAND RATES TABLE

- 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?
 - 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]

(3)

(2)

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)
- 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.

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**]

(3)

TOTAL: 100

8.2

Memo

111	4 01		
1.1.1	$\begin{pmatrix} x^{2} - 81 \\ -(x^{2} - 9)(x^{2} + 9) \end{pmatrix}$		
	$ - (x - 3)(x + 3)(x^{2} + 9) $	$\int \sqrt{(x^2 - 9)(x^2 + 9)} \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)(x^2 + 9)) \\ \int ((x^2 - 9)(x^2 + 9)(x^2 +$	
	$= \left(\lambda - 3 \right) \left(\lambda + 3 \right) \left(\lambda - 3 \right)$	$(x-3)(x+3)(x^2+9)$	(2)
1.1.2	$6x^2y - 10xy + 15x - 25$		(-)
	= 2xy(3x-5) + 5(3x-5)	$\checkmark 2xy(3x-5)$	
	=(2xy+5)(3x-5)	$\sqrt{5(3x-5)}$	
	OB/OF	(2xy+5)(3x-5)	(3)
			(3)
	$6x^2 = 10x + 15x - 25$	(2.(2	
	$6x^{2}y - 10xy + 15x - 25$ - $3r(2ry + 5) - 5(2ry + 5)$	$\checkmark 3x(2xy+5)$ $\checkmark -5(2xy+5)$	
	= (2xy + 5)(3x - 5)	$\checkmark (2xy+5)$ $\checkmark (2xy+5)(3x-5)$	
			(3)
1.2.1	$\frac{3}{2} + \frac{2}{2} - \frac{21}{2}$		
	$a-4$ $a+3$ a^2-a-12		
	$=\frac{3}{a-4}+\frac{2}{a+3}-\frac{21}{(a-4)(a+3)}$	$\checkmark (a-4)(a+3)$	
	-3(a+3)+2(a-4)-21	(a+3)+2(a-4)-21	
	$-\frac{(a-4)(a+3)}{(a+3)}$	(a-4)(a+3)	
	$=\frac{3a+9+2a-8-21}{(a-4)(a+2)}$		
	(a-4)(a+5) 5a - 20		
	$=\frac{3a-20}{(a-4)(a+3)}$	✓ simplification, i.e./	
	5(a-4)	vereenvoudiging, d.i. $5a - 20$	
	$=\frac{1}{(a-4)(a+3)}$	$\frac{-2}{(a-4)(a+3)}$	
	$=$ $\frac{5}{}$		
	<i>a</i> + 3	✓ answer/ <i>antwoord</i>	(5)
L			(~)

1.2.2	$10^{2x+3}.4^{1-x}$		
	25^{2+x}		
	$= \frac{(2.5)^{2x+3} \cdot (2^2)^{1-x}}{(5^2)^{2+x}}$ = $\frac{2^{2x+3} \cdot 5^{2x+3} \cdot 2^{2-2x}}{5^{4+2x}}$ = $2^{2x+3+2-2x} \cdot 5^{2x+3-4-2x}$ = $2^5 \cdot 5^{-1}$ = $\frac{32}{5}$ = $6\frac{2}{5}$	✓ writing bases in terms of prime factors/ <i>skryf basisse in terme van</i> <i>priemfaktore</i> ✓ simplification/ <i>vereenvoudiging</i> ✓ adding and subtracting indices/ <i>optel en aftrek</i> <i>van eksponente</i> ✓ $2^5.5^{-1}$ or/ <i>of</i> $\frac{32}{5}$ or/ <i>of</i> $6\frac{2}{5}$	(4)
131	/27	\checkmark answer/ <i>antwoord</i>	(1)
1.5.1	$\sqrt{27}$		(1)
1.3.2	$\sqrt{-27}$	✓ answer/ <i>antwoord</i>	(1) [16]

2.1.1	$15x^2 - 14x - 8 = 0$	✓ standard form/ <i>standaardvorm</i>
	(5x+2)(3x-4)=0	✓ factorisation/ <i>faktorisering</i>
	5x + 2 = 0 or $3x - 4 = 0$	✓✓ answers/ <i>antwoorde</i>
	$x = -\frac{2}{5}$ or $x = \frac{4}{3}$	(4)
2.1.2	$5^x = \frac{1}{125}$	
	$5^x = \frac{1}{5^3}$	<i>. (</i> <i>r</i>−3
	$5^x = 5^{-3}$ $x = -3$	$\checkmark answer/antwoord $ (2)
2.2.1	$3(x+7) < \frac{x}{2} + 1$	
	$\frac{2}{3x+21} < \frac{x}{x} + 1$	\checkmark 3 <i>x</i> +21
	6x + 42 < x + 2	✓ $6x + 42 < x + 2$
	5x < -40	
	x < -8	(3)

2.2.2	$-\frac{1}{8}$	✓ indicating numbers to the left of -8 and -8 not included/ dui getalle links van -8 aan met -8 nie ingesluit (1)
2.3	Let the amount of money Mary had be $Rx/Laat$ die bedrag geld wat Mary gehad het x wees. $\frac{1}{5}x = \frac{1}{3}x - 28$	$\checkmark \frac{1}{3}x - 28$ $\checkmark \frac{1}{5}x$
	3x + 420 = 5x 2x = 420 x = 210 Mary had R210/Mary het R210 gehad.	 ✓ equation/vergelyking ✓ 210 (4) [14]

3.1.1	-7;-12	✓ - 7
		✓ -12
		(2)
3.1.2	$T_{n} = -5n + 13$	$\checkmark -5n$
	n	✓ 13
		(2)
3.1.3	$T_n = -5n + 13$	
	T = -5(30) + 13	\checkmark substitution of/ <i>substitusie van</i>
	$r_{30} = 5(50) + 15$	n = 30
	=-137	✓ answer/antwoord
2.1.4	z 10 100	(2)
3.1.4	-5n+13 = -492	\checkmark -5 <i>n</i> +13 = -492
	-5n = -505	
	n = 101	✓ answer/ <i>antwoord</i>
2.0.1		(2)
3.2.1	$T_n = 2n - 1$	$\checkmark 2n$
		$\mathbf{v} = 1$ (2)
222	= (2 1) ²	(2)
3.2.2	$T_n = (2n-1)^2$	$\checkmark (2n-1)^2$
	$=4n^2-4n+1$	(1)
3.2.3	$T_n = (2n-1) - (2n-1)^2$	$\checkmark (2n-1) - (2n-1)^2$
	$=2n-1-(4n^2-4n+1)$	$\checkmark 2n-1-(4n^2-4n+1)$
	$=2n-1-4n^{2}+4n-1$	$\checkmark 2n - 1 - 4n^2 + 4n - 1$
	$=-4n^2+6n-2$	✓ answer/antwoord
		(4)
		[15]

4.1	<i>y</i> = 1	✓ answer/ <i>antwoord</i>
		(1)
4.2	(0;2) g	f: \checkmark shape of f/vorm van f \checkmark x-intercepts of f/ x-afsnitte van f \checkmark y-intercept (TP) of f/y-afsnit (DP) van f
	y = 1 (-1; 0) 0 (1; 0) f	g: ✓ shape of g/vorm van g ✓ asymptote of g/ asimptoot van g ✓ y-intercept of g/ y-afsnit van g
		(6)
4.3	Range of $f/Waardeversameling van f: (-\infty; 2]$	✓ (-∞;2]
	OR/OF	(1)
	Range of $f/Waardeversameling$ van f : $y \le 2$	✓ $y \le 2$ (1)
4.4	Maximum of $3^{f(x)}$ will be obtained when $f(x)$ is at maximum. Max of $f(x)$ is 2 Max of h will be $3^2 = 9$ Maksimum van $3^{f(x)}$ sal verkry word wanneer $f(x)$ by maksimum is. Maks van $f(x)$ is 2	✓ Max of $f(x)$ is 2/ Maks van $f(x)$ is 2 ✓ Max of $h = 9$ / Maks van $h = 9$
4.5	Maks van h sal $3^2 = 9$ wees.	(2)
4.5	f would have been reflected in the x-axis f sou in die x-as gereflekteer gewees het	✓ reflected/gereflekteer ✓ in the x-axis/ in die x-as (2)
		[12]

QUE		
5.1	a = gradient of g	$\checkmark a = \frac{-4-2}{-4-2}$
	$=\frac{-4-4}{-4}$	-1-2
	-1-3	Substituting/substitusia
	= 2	$\mathbf{B}(3 \cdot 4)$
	4 = 2(3) + q	
	q = -2	
	g(x) = 2x - 2	(2)
	OR/OF	
	a = gradient of g	4-(-4)
	$=\frac{4-(-4)}{(-4)}$	$\checkmark a = \frac{(-1)}{3 - (-1)}$
	3 - (-1)	
	= 2	✓ substituting/substitusie
	-4 = 2(-1) + q	A(-1;-4)
	q = -2	
	g(x) = 2x - 2	(2)
		(-)
	OR/OF	
	g(x) = ax + q	✓ substituting both points/
	$4 = 3a + q \dots 1$	substituste van betae panie
	$-4 = -a + q \dots 2$	
	1 - 2:	
	8 = 4a	
	a=2	
	Substitute in 1/Substitusie in 1:	• solving simultaneously/
	4 = 3(2) + q	ios gelykiyulg op
	q = -2	(2)
	g(x) = 2x - 2	
5.2	$\frac{1}{x-1} = 2x-2$	
	x	✓ equating/gelykstelling
	$\frac{1}{2} = 2r - 1$	
	x	
	$1 = 2x^2 - x$	\checkmark standard form/
	$2x^2 - x - 1 = 0$	standaardvorm
	(2x+1)(x-1) = 0	
	1	✓ factors/ <i>faktore</i>
	$x = -\frac{1}{2}$ or $x = 1$	\checkmark x-values/-waardes
	2	(4)
1		

5.3	$-\frac{1}{2} \le x < 0 \text{or/}of x \ge 1$	$\checkmark x \ge -\frac{1}{2}$	
	OR/OF	$\checkmark x < 0$ $\checkmark x \ge 1$	
		✓ [-0,5	(3)
	$\left[-\frac{1}{2};0\right)\cup\left[1;\infty\right)$	✓ 0) ✓ [1 : ∞)	
		• [1,∞)	(3)
5.4	$f(3) = \frac{1}{3} - 1$	$\sqrt{\frac{1}{3}} - 1$ or $-\frac{2}{3}$	
	$=-\frac{2}{3}$		
	Length of BE = $4 - f(3)$	$\checkmark 4 - f(3)$	
	$=4-\left(-\frac{2}{3}\right)$		
	$=4+\frac{2}{3}$		
	$=4\frac{2}{3}$	✓answer/antwoord	(3)
	OR/OF		
	$BE = 2x - 2 - \frac{1}{x} + 1$	$\checkmark 2x - 2 - \frac{1}{x} + 1$	
	$2x^2 - x - 1$		
	$=$ $\frac{x}{(x^2 + y^2)}$		
	$(x = 3)$ BE $= \frac{2(3)^2 - (3) - 1}{3}$	$\checkmark \frac{2(3)^2 - (3) - 1}{3}$	
	$=\frac{18-4}{3}$		
	$=4\frac{2}{-1}$	✓ answer/ <i>antwoord</i>	
	3		(3)
5.5	h(x) = f(x) + 3	✓ answer/ <i>antwoord</i>	
	$h(x) = \frac{1}{x} + 2$		(1) [13]

6.1	d - 5 + d - 1 = 0	$\checkmark d - 5 + d - 1 = 0$	
	2d = 6	$\checkmark d = 3$	
	d = 3	((2)
6.2	y = a(x-2)(x+2)		
	-9 = a(1-2)(1+2)	$\checkmark y = a(x-2)(x+2)$	
	-9 = a(-1)(3)	\checkmark subs $(1 \cdot 0)$	
	-3a = -9	• $subs(1, -9)$	
	a = 3	$\checkmark a = 3$	
	$f(x) = 3\left(x^2 - 4\right)$		
	$=3x^{2}-12$		
	c = -12	$\checkmark_c = -12$	
		((4)
			[6]

7.1	R5000 #525.20	✓ selects/kies
	$\frac{1}{9.518569 \text{ rands per dollar}} = $525,29$	9,515869
		✓ answer/ <i>antwoord</i>
	OR/OF	(2)
	B 5000 × 0 105058 dollars non rond \$525.20	✓ selects/ <i>kies</i>
	$K3000 \times 0,103038$ donars per rand = \$323,29	0,105058
		• answer/antwoord (2)
7.2.1	$A = D(1+i)^n$	\checkmark formula/formule
,	$A = I \left(1 + l \right)$	$\checkmark 5000(1+0.061)^3$
	$=5000(1+0,061)^{3}$	\checkmark B5 071 05
	= R5 971,95	(3)
7.2.2	Let the amount that Zach invests each year be <i>x/Laat die bedrag</i>	
	wat Zach elke jaar belê, x wees.	
	$x(1+0.09)^2 + x(1+0.09)^1 = 5980$	$\checkmark x(1+0.09)^2$
	$r[1.09^2 + 1.09] - 5980$	$\sqrt{r(1+0.09)^{1}}$
	x[1,09 + 1,09] = 5980	$\checkmark x(1+0,03)$
	$x = \frac{5980}{1.00^2 - 1.00}$	as gemeenskaplike faktor
	$1,09^2 + 1,09$	✓ answer/ <i>antwoord</i>
	$= R2\ 624,99$	(4)
	OR/OF	
	I at the amount that Zach invests each year be r/I and dia badrag	
	wat Zach elke jaar belê x wees	$\sqrt{r(1+0.00)^{1}}$
	war Zach eine jaar bere, x wees.	(1+0,09)
	$\left[x(1+0.09)^{1} + x(1+0.09)^{1} = 5980\right]$	$\left \checkmark \left[r(1 + 0.00)^{1} + r \right] \right $
	r(2.09)(1.09) = 5980	[x(1+0,09) + x]
	$\lambda(2,09)(1,09) = 3900$	\mathbf{v} x as common factor/
	$x = \frac{5980}{(2 - 2 - 2)(2 - 2 - 2)}$	\checkmark answer/antwoord
	(2,09)(1,09)	(4)
	= R2 624,99	[9]

8.1.1	Sample space/ <i>Steekproefruimte</i> (64) Soccer/ <i>sokker</i> (24) 14 10 18 22	 ✓ diagram shape/ diagramvorm ✓ 14 in correct position/ in korrekte posisie ✓ 10 in correct position/ in korrekte posisie ✓ 18 in correct position/ in korrekte posisie ✓ 22 in correct position/ in korrekte posisie ✓ 22 in correct position/ in korrekte posisie
8.1.2 (a)	P(Soccer and Rugby) = $\frac{10}{64} = \frac{5}{32} = 0,15625 = 15,63\%$	✓ answer (in any form)/ antwoord (in enige vorm) (1)
8.1.2 (b)	P(Soccer or Rugby) = $\frac{14+10+18}{64} = \frac{42}{64} = \frac{21}{32} = 0,65625 = 65,63\%$ OR / OF P(Soccer or Rugby) = $1 - \frac{22}{64} = \frac{21}{32}$	✓ answer (in any form)/ antwoord (in enige vorm) (1)
8.1.3	No/Nee. Some boys play both soccer and rugby/Party seuns speel sokker en rugby. OR/OF No/Nee $P(S \text{ and } R) \neq 0 / P(S en R) \neq 0$	 ✓ No/Nee ✓ Reason/Rede ✓ No/Nee ✓ Reason/Rede
8.2	P(more than 2 passengers per car) / P(meer as 2 passasiers per kar) $= \frac{5+1}{7+11+6+5+1}$ $= \frac{6}{30}$ $= \frac{1}{5} = 0.2 = 20\%$	(2) \checkmark numerator/teller 6 \checkmark denominator/ <i>noemer</i> 30 \checkmark answer/antwoord (accept/aanvaar $\frac{6}{30} \operatorname{or} \frac{1}{5} \operatorname{or}/of$ 0,2 or/of 20%) (3)
8.3	P(not getting a six) / P(nie 'n ses kry nie) = $1 - \left(\frac{10}{36} + \frac{1}{36}\right)$ = $\frac{25}{36}$	$\checkmark \left(\frac{10}{36} + \frac{1}{36} \right) \\ \checkmark 1 - \left(\frac{10}{36} + \frac{1}{36} \right) \\ \checkmark \frac{25}{36} $ (3) [15]







Grade 10 - Trig and Geometry (Paper 2) November Exam Total: 100 Time: 120min

QUESTION 1

The heights of 20 children were measured (in centimetres) and the results were recorded. The data collected is given in the table below.

127	128	129	130	131	133	134	134	135	136	
137	138	139	140	141	142	142	143	144	145	
1.1	Write dow	on the med	lian heigh	t measured	d.					(1)
1.2	Determine	e:								
	1.2.1	The mea	an height							(2)
	1.2.2	The rang	ge							(1)
	1.2.3	The inte	rquartile r	ange						(3)
1.3	Draw a bo	ox and whi	isker diagi	am to rep	resent the	data.				(2) [9]

QUESTION 2

The intelligence quotient score (IQ) of a Grade 10 class is summarised in the table below.

IQ INTERVAL	FREQUENCY
$90 \le x < 100$	4
$100 \le x < 110$	8
$110 \le x < 120$	7
$120 \le x < 130$	5
$130 \le x < 140$	4
$140 \le x < 150$	2

2.1	Write down the modal class of the data.	(1)
2.2	Determine the interval in which the median lies.	(2)
2.3	Estimate the mean IQ score of this class of learners.	(3) [6]

- 3.1 Show that a triangle ABC, with vertices A(1; 1); B(3; 6) and C(6; 3), is an isosceles triangle.
- 3.2 In the diagram below, ADCB is a kite with A(3; 5) and B(-1; -4). AD = DC and AB = BC. D is a point such that AD is parallel to the *x*-axis and AD = 5 units. CD is perpendicular to the *x*-axis. The diagonals intersect at P.



3.2.5	Calculate the area of the kite ADCB.	(3) [15]
3.2.4	Calculate the length of line AC.	(2)
3.2.3	Calculate the gradient of line BD.	(2)
3.2.2	Write down the coordinates of point P.	(2)
3.2.1	Show that the coordinates of C are $(8; 0)$.	(2)

(4)

4.1 A right-angled triangle has sides a, b and c and the angle θ , as shown below.



4.1.1 Write the following in terms of a, b and c:

- (a) $\cos\theta$ (1)
- (b) $\tan\theta$ (1)
- (c) $\sin(90^\circ \theta)$ (2)

4.1.2 If it is given that
$$a = 5$$
 and $\theta = 50^{\circ}$, calculate the numerical value of b. (2)

4.2 Given that
$$\hat{A} = 38,2^{\circ}$$
 and $\hat{B} = 146,4^{\circ}$.
Calculate the value of 2cosecA + cos3B. (3)
4.3 Simplify fully, WITHOUT the use of a calculator:

$$\frac{\sin 45^{\circ} \cdot \tan^{2} 60^{\circ}}{\cos 45^{\circ}}$$
(4)

4.4 Given that $5\cos\beta - 3 = 0$ and $0^{\circ} < \beta < 90^{\circ}$.

If
$$\alpha + \beta = 90^{\circ}$$
 and $0^{\circ} < \alpha < 90^{\circ}$, calculate the value of $\cot \alpha$. (4) [17]

5.1 In the sketch below, ΔMNP is drawn having a right angle at N and MN = 15 units. A is the midpoint of PN and $\widehat{AMN} = 21^{\circ}$.



Calculate:

AN	(3)
PŴN	(3)
MP	(3)
	AN PŴN MP

5.2 Calculate θ if $2\sin(\theta + 15^\circ) = 1,462$ and $0^\circ \le \theta \le 90^\circ$. (3)

[12]

The graphs of $f(x) = a \sin x$ and $g(x) = \cos x + 1$ for $x \in [0; 360]$ are sketched below.



6.1	Write down the value of <i>a</i> .	(1)
6.2	Write down the period of f .	(1)
6.3	Write down the range of g .	(2)
6.4	For which values of x for $x \in [0^\circ; 360^\circ]$ will $f(x).g(x) > 0$?	(2)
6.5	The graph g is reflected about the x-axis and then shifted 2 units upwards to obtain	

^{6.5} The graph g is reflected about the x-axis and then shifted 2 units upwards to obtain the graph h. Write down the equation of h. (2) [8]

The diagram below represents a cross-section of the peaks of Table Mountain, T, and Lions Head, L, above sea level. Points M and N are directly below peaks L and T respectively, such that MPN lies on the same horizontal plain at sea level and P is directly below C.

MN = 3 100 m.

The angle of elevation of L from N is β and the angle of elevation of T from M is θ . It is given that $\tan \theta = 0.35$ and $\tan \beta = 0.21$.



7.1 Calculate the ratio of LM : TN.

(4)

- 7.2 A cable car, C, travelling from the top of Table Mountain, T, follows a path along TCM.
 - 7.2.1 Calculate the angle formed (MTN) between the cable and the vertical height TN. (2)
 - 7.2.2 If the cable car, C, travels along the cable, such that TC = 400 m, calculate the height of the cable car above sea level at that instant. (5)

[11]

Give reasons for your statements in QUESTIONS 8 and 9.

QUESTION 8

8.1 Complete the following statement:

If the opposite angles of a quadrilateral are equal, then the quadrilateral ... (1)

8.2 Use the sketch below to prove that the opposite sides of a parallelogram are equal.



(6)

8.3 In the sketch below, KPMN is a parallelogram. ON bisects KNM and OM bisects NMP.



8.3.1 Show that $\hat{NOM} = 90^{\circ}$. (3)



[16]

9.1 Complete the following statement:

The line through the midpoint of two sides in a triangle is parallel to and ... the third side.

9.2 In $\triangle PQR$, A and B are the midpoints of sides PQ and PR respectively. AR and BQ intersect at W. D and E are points on WQ and WR respectively such that WD = DQ and WE = ER.



Prove that ADEB is a parallelogram.

(5) [6]

TOTAL: 100

(1)

Memo

1.1	Median/ <i>Mediaan</i> = $\frac{136+137}{2}$ = 136,5		✓ answer/antwoord (1)
1.2.1	Mean/ <i>Gemiddelde</i> = $\frac{2728}{20}$		 ✓ 2728 ✓ answer/antwoord
	= 136,4 cm		Answer only/ <i>slegs antw</i> 2/2 (2)
1.2.2	Range/Variasiewydte = $145 - 127$ = 18 cm		✓ answer/antwoord (1)
1.2.3	Lower quartile/Onderste kwartiel = 132 Upper quartile/Boonste kwartiel = $141\frac{1}{2}$ Interquartile range/IKO = $141\frac{1}{2}$ — 132 = 9,5 cm	PPROVED MARKING CUIDELINE 2016 -11- 08 PPROVED MARKING CUIDELINE	 ✓ Lower quartile/Onderste kwartiel ✓ Upper quartile/Boonste kwartiel ✓ answer/antwoord Answer only full marks Slegs antw volpunte
1.3			(3) \checkmark median/min/max/ mediaan/min/maks \checkmark Q ₁ and/ en Q ₃ CA from 1.1 & 1.2.3 VA using f 1 + 6 + 2.2
	120 100 100 140 140		(2) [9]

2.1	Modal class(Module klas)	1
		✓ answer/ <i>antwoord</i>
	$100 \le x \le 110$	Do not penalise notation
		Notasie word nie
		genenaliseer nie
		(1)
2.2	$110 \le x \le 120$	✓ ✓ answer/antwoord
		Note: if learner identifies
		position of median only: 1/2
		Nota: Indien leerder slegs
		posisie van mediaan bepaal:
		1/2
		(2)
2.3	Estimate Mean IQ of students/Geskatte gemiddelde IK	
		✓ 3480
	$=\frac{3480}{}$	✓ 30
	30	
	117	✓ answer/antwoord
	= 116	CA on numerator only
		VA slegs vir teller
		Answer only/ Slegs antw 3/3
		(3)
		[6]

3.1	AB = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ = $\sqrt{(3 - 1)^2 + (6 - 1)^2}$ = $\sqrt{29}$	 ✓ corr. subst. in corr. formula/vervang in korrekte formule ✓ distance/afstand AB
	AC = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ = $\sqrt{(6 - 1)^2 + (3 - 1)^2}$ = $\sqrt{29}$	✓ subst. in corr. formula/vervang in korrekte formule
	AB = AC $\therefore \Delta ABC$ is isosceles/gelykbenig	<pre>✓AB = AC or / of ΔABC is isosceles / gelykbenig</pre>
		Wrong formula 0/4 marks <i>Verkeerde formule 0/4</i> (4)
3.2.1	AD is parallel to the x-axis/AD parallel aan x-as \therefore A and D have the same y-coordinates/A en D het dieselfde	

y-koördinate	
But / maar $AD = 5$ units/eenhede	
∴ D(8;5)	✓ explaining x-coordinate/
CD is perpendicular to the x-axis/CD is loodreg op x-as	x-koördinaat verduidelik
 ∴ C and D have the same x-coordinate/C en D het dieselfde x-koördinate But C lies on the x-axis./C lê op die x-as 	✓ explaining y-coordinate/ y-koördinaat verduidelik (2)
\therefore C(8;0)	
Or any other valid explanation / of enige ander geldige rede	

3.2.2	P is midpoint of AC the diagonals of the kite/	
	<i>P</i> is middelpunt van AC, die hoeklyne van die vlieër	
		\checkmark x-value/waarde
	3+8 5+0	✓ v-value/waarde
	$\therefore P - ; - ; - ;$, , , , , , , , , , , , , , , , , , ,
	$\mathbf{P}\left(\begin{array}{c}11\\ \cdot\\ \cdot\\$	(2)
	$F\left(\frac{1}{2},\frac{1}{2}\right)$	
3.2.3.	B(-1; -4) D(8; 5)	
		✓ substitution/vervang
	$m_{\rm RD} = \frac{5+4}{$	
	8+1	✓ answer/antwoord
		Answer only 2/2
	= 1	Slegs antw $2/2$ (2)
		(2)
224	$A(2:5) \approx C(2:0)$	
5.2.4	$A(5, 5) \approx C(8, 0)$	
	$AC = \sqrt{(0 - 5)^2 + (9 - 2)^2}$	✓ substitution/vervang
	$AC = \sqrt{(0-3)^2 + (8-3)^2}$	
	$=\sqrt{E0}$ or left $E\sqrt{2}$ or left 7.07	✓ answer/antwoord
	$-\sqrt{50}$ $\frac{1}{0}$ $\frac{1}{0}$ $\frac{1}{0}$ $\frac{1}{0}$ $\frac{1}{0}$ $\frac{1}{0}$ $\frac{1}{0}$	(2)
3.2.5	B(-1; -4) & D(8; 5)	
	$BD = \sqrt{(5+4)^2 + (8+1)^2}$	
	P 10 100 10 100	
	$=\sqrt{162}$	✓ length/ <i>lengte</i> BD
	$Area = \frac{1}{2}(BDAC)$	substitution in corr
	$\frac{1}{2}$	formula/ varyang in korr
	1	formula
	$=\frac{1}{2}(\sqrt{162}.\sqrt{50})$	Jormule
	$=\frac{2}{45}$	correct area formula only
		1/3
	OR / OF	slegs korrekte greaformule
		1/3
	B(-1; -4) & D(8; 5)	(3)
	$BD = \sqrt{(5+4)^2 + (8+1)^2}$	OR/OF
	$-\sqrt{162}$	✓ length/lengte BD
	- V102	
	$A(3 \cdot 5) \& P(5 5 \cdot 2 5)$	
	$AD = \sqrt{(2 - \Gamma \Gamma)^2 + (\Gamma - 2\Gamma)^2}$	
	$AP = \sqrt{(3 - 5,5)^2 + (5 - 2,5)^2}$	✓ length/lengte AP
	$=\frac{5\sqrt{2}}{2}$	
	-	
	Area ADCB = area $\triangle ABD$ + area $\triangle CBD$	
	= 2 (0,5 X BD X AP)	
	$=2(\frac{1}{2} \times \sqrt{162} \times \frac{5\sqrt{2}}{2})$	✓ answer/antwoord
		(3)
	- 45	[15]
	- +5	I

4.1.1(a)	b	✓ answer/antwoord
		(1)
111(b)		1 answorlantwoord
4.1.1(0)		• answer/ $uniwoord$ (1)
	D	
4.1.1(c)	b	✓✓ answer/antwoord
		0 or / of 2 marks /punte
		(2)
4.1.2	a	
	$\tan\theta = \frac{1}{b}$	
	$\tan 50^\circ = \frac{5}{2}$	✓ correct subst in ratio/
	b b	korr subst in verhouding
	$\therefore b = \frac{5}{1-5}$	
	$\frac{\tan 50^{\circ}}{b-4.20}$	✓ b value/waarde
	0-4,20	(penalise for rounding off only in this question)
		(afronding word slegs in
		hierdie vraag gepenaliseer)
		(2)
4.2	$2\cos c 38.2^\circ + \cos 3(146.4^\circ)$	
	$=2(-1)+22(146.4^{\circ})$	$\checkmark (\frac{1}{\sin 38.2^{\circ}}) \text{ or/of } 2(1,017)$
	$-2(\frac{1}{\sin 38.2^{\circ}}) + \cos(140,4^{\circ})$	or/of 3,234
	- 2.42	1 anguar acquirate/
	- 5,42	antwoord akkuraat
		uniwoor a antar aa
		[Answer only – full marks]
		[Slegs antwoord – volpunie]
12	2	(5)
4.3	$\frac{\sin 45^\circ \cdot \tan^2 60^\circ}{\cos^2 2}$	
	cos45°	$1 \sqrt{2}$
	$\begin{pmatrix} 1 \\ \sqrt{3} \\ \sqrt{3} \end{pmatrix}$	$\sqrt{\frac{1}{\sqrt{2}}}/\frac{1}{2}$
	$\left(\frac{\sqrt{2}}{\sqrt{2}}\right)\left(\frac{1}{1}\right)\left(\frac{1}{1}\right)$	
	$\frac{1}{\sqrt{2}}$	
	V2	$\sqrt{\sqrt{3}}$
	3	1
	$\frac{\sqrt{2}}{1}$	$1 \sqrt{2}$
	$\sqrt{2}$	$\sqrt{\frac{1}{\sqrt{2}}} / \frac{\sqrt{2}}{2}$ (denominator /
		noemer)
	$\frac{3}{5}$, $\frac{\sqrt{2}}{\sqrt{2}}$	
	$\sqrt{2}$ 1	v answer/antwoord
	3	Answer only/ Slegs aniw
		(4)
4.4	$\cos \theta = \frac{3}{2}$	$\sqrt{\cos \beta} = \frac{3}{2}$
	$\cos \mu = \frac{1}{5}$	$-\frac{1}{5}$
		✓ application Pyth. Th.
	$y^2 = 5^2 - 3^2$	toepassing van Pyth. St.

$$y = 4$$

$$\therefore \cot \alpha = \frac{4}{3}$$
OR/OF
$$\cos \beta = \frac{3}{5}$$

$$\beta = 53,13^{\circ}$$

$$\alpha = 36,87^{\circ}$$

$$\cot \alpha = \frac{1}{\tan 36,87^{\circ}} = 1,33$$
OR/OF
$$(4)$$

$$\sqrt{y = 4}$$

$$\sqrt{answer/antwoord}$$

$$\sqrt{answer/antwoord}$$

$$\sqrt{answer/antw}$$

$$\sqrt{answer/antw}$$

$$(4)$$

$$(17]$$

F11	T A ANAN	
5.1.1	$\ln \Delta AWN$	
	$\tan \widehat{\mathbf{M}} = \frac{\mathbf{A}\mathbf{N}}{\mathbf{A}\mathbf{N}}$	A to $\widehat{\mathbf{N}} = AN$
	$\tan M = \frac{1}{MN}$	\mathbf{v} tan M = $\frac{1}{MN}$
	AN	
	$\tan 21^\circ = \frac{111}{15}$	
	$AN = 15. \tan 21^{\circ}$	✓ substitute/vervang
	AN = 5.76 units/eenhede	✓ answer/antwoord
		(3)
512	DN = 2(5.70)	
5.1.2	PN - 2(5,76) = 11.52	✓ PN =11 52
	$\tan \widehat{\mathbf{M}} = \frac{\mathbf{PN}}{\mathbf{N}}$	11,52
	MN	
	11,52	$\checkmark \tan \widehat{M} = \frac{11,52}{15}$
	$=$ $\frac{15}{15}$	10
	Q	1 answer/antwoord
	$M = 37,52^{\circ}$ $P\widehat{M}N = 37,52^{\circ}$	(3)
5.1.3	$\sin 37.52 = \frac{11,52}{2}$	$\checkmark \sin 37,52^\circ = \frac{11,52}{3}$
	MP	МР
	$MP = \frac{11,52}{2}$	✓ MP subject/onderwerp
	sin37,52	
	MP = 18.92 (accept 18.91 also / <i>gamuaar</i> ook 18.01)	√answer/antwoord
	(accept 18,91 also / <i>dunvaur box</i> 18,91)	(3)
	OR/OF	
		✓ using Pyth <i>gebruik</i>
	$MP^2 = 15^2 + 11,52^2$ Pyth	✓ subst
	MP = 18,91	✓ answer/ <i>antw</i> (3)
	ANY OTHER VALID METHOD/	(3)
5.0	ENIGE ANDER GELDIGE METODE	
5.2	$2\sin(\theta + 15^\circ) = 1,462$ $\sin(\theta + 15^\circ) = 0.721$	√0,731
	$\therefore \theta + 15^{\circ} = 46.97^{\circ}$	√46.97°
	$\theta = 46,97^{\circ} - 15^{\circ}$	✓answer/antwoord
	$\theta = 31,97^{\circ}$	Answer only /slegs antw
		3/3
		(3)

6.1	<i>a</i> = 2	✓ answer/antwoord	(1)
6.2	Period/periode $f = 360^{\circ}$	✓answer/antwoord	(1)
6.3	$y \in [0; 2]$ or / of $0 \le y \le 2$	✓ 0 and 2 ✓ notation / <i>notasie</i>	(2)
6.4	$0^{\circ} < x < 180^{\circ}$	 ✓ critical values/ kritiese waardes ✓ correct inequalities / korrekte ongelykhede 	(2)
6.5	$y = -\cos x - 1 + 2$ $= -\cos x + 1$	$\checkmark -\cos x - 1$ $\checkmark + 2$ OR /OF $\checkmark \checkmark \text{ answer/antwoord}$ Answer only Slegs antw 2/2	(2) [8]

 $\frac{LM}{3100} = tan\beta = 0.21$ 7.1 $\sqrt{\frac{LM}{3100}} = tan\beta = 0.21$ $\therefore LM = 3100 \times 0.21 = 651 m$ √ 651m $\frac{TN}{3100} = tan\theta = 0.35$ \therefore TN = 3100 × 0,35 = 1085 m ✓ 1085m $\frac{LM}{TN} = \frac{651}{1085} = \frac{3}{5}$ ✓ answer/ antwoord OR / OF $\tan\beta = \frac{LM}{MN} = 0.21 \qquad \tan\theta = \frac{TN}{MN} = 0.35$ $\checkmark \tan \beta = \frac{LM}{MN}$ $\checkmark \tan \theta = \frac{TN}{MN}$ $\frac{\text{LM}}{\text{MN}} \div \frac{\text{TN}}{\text{MN}} = \frac{0.21}{0.35}$ $\checkmark \frac{LM}{MN} \div \frac{TN}{MN} = \frac{0.21}{0.35}$ $\frac{LM}{TN} = \frac{0.21}{0.35}$ $= \frac{3}{5}$ $\therefore LM : TN$ 3:5✓ answer/antw LM : TN (4) $\checkmark \theta = 19,29^{\circ}$ 7.2.1 $tan\theta = 0.35$ $\theta = 19.29^{\circ}$ $\therefore MTN = 70,71^{\circ}$ ✓ answer/ antwoord (2) $\checkmark \cos 19,29^\circ = \frac{3100}{\text{TM}}$ $\cos 19,29^\circ = \frac{3100}{\text{TM}}$ 7.2.2 ✓ TM = 3284.39 TM = 3284,39✓ CM = 2884,39 CM = 2884.39 $\checkmark \sin 19,29^\circ = \frac{CP}{2884,39}$ $\therefore \sin 19,29^\circ = \frac{CP}{2884,39}$ \therefore CP = 2884,39(sin 19,29°) ✓ answer/ antwoord CP = 952,86 m(5)



8.1	is a parallelogram/is 'n parallelogram	✓ answer/ <i>antwoord</i> (1)
8.2	In \triangle ABD and/en \triangle CDB $\hat{D}_1 = \hat{B}_2$ [alt. angles/verw. hoek, AD BC] $\hat{B}_1 = \hat{D}_2$ [alt. angles/verw. hoek, AB DC] BD = BD [common side/ dieselfde sy] $\therefore \triangle$ ABD $\equiv \triangle$ CDB [A,A,S] \therefore AB = DC, AD = BC	 ✓S ✓R ✓S/R ✓S/R ✓S/R ✓S Penalise once for leaving out lines in reason Penaliseer slegs een keer vir lyne in rede (6)
8.3.1	Let/Laat $\hat{N}_{1=} \hat{N}_{2=} x$ [ON bisects/halveer KNM] Let/Laat $\hat{M}_{1=} \hat{M}_{2=} y$ [OM bisects/halveer NMP] $\therefore 2x + 2y = 180^{\circ}$ [co-int./ko-bin. hoek KN PM] $\therefore x + y = 90^{\circ}$ $\hat{O}_{2} + x + y = 180^{\circ}$ [int. angles of/binnehoeke van Δ] $\therefore \hat{O}_{2} + 90^{\circ} = 180^{\circ}$ $\therefore \hat{O}_{2} = 90^{\circ}$	✓ S/R ✓ S/R ✓ substitution/vervang $(x + y = 90^{\circ})$ (3)
8.3.2	$\hat{N}_{2} = \hat{O}_{1} [alt. angle/verw. hoek KP \parallel NM]$ $\hat{O}_{1} = \hat{N}_{1}$ $\therefore KO = KN [opp. Angles =/oorst hoeke =]$ $\hat{O}_{3} = \hat{M}_{1} [alt angle/verw. KP \parallel MN]$ $\hat{O}_{3} = \hat{M}_{2}$ $\therefore OP = PM [sides opp. = angles] \\ [sye oor. = hoeke]$ But/Maar KN = PM [opp. sides =/oor sye =] $\therefore KO = OP$ $\therefore O is the midpoint/middelpunt$	 ✓ S/R ✓ S/R ✓ S/R ✓ S/R ✓ S/R ✓ S/R ✓ [16]

9.1	half the length of /die helfde van die lengte van	✓ half /helfte (1)
9.2	AB QR[line joining midpoint or midpoint theorem] [lyn deur middelpunte of middelpuntstelling]AB = $\frac{1}{2}$ QR[line joining midpoint] [lyn deur middelpunte]DE QR[line joining midpoint/lyn deur middelpunte]DE = $\frac{1}{2}$ QR	✓R ✓S/R ✓S
	 ∴ AB DE and/en AB = DE ∴ ADEB is a parm. [one pair of opp. sides = and] [een paar teenoorstande sye = en] 	✓ S (both/ <i>albei</i>) ✓ R [5]

TOTAL/TOTAAL: 100






Grade 10 - Trig and Geometry (Paper 2) November Exam Total: 100 Time: 120min

QUESTION 1

Nineteen girls were required to complete a puzzle as quickly as possible. Their times (in seconds) were recorded and are shown in the table below.

	14	15	16	16	17	17	18	18	19	19	
	19	20	21	21	22	23	24	24	29		
1.1	Iden	tify the	median ti	me taken	by the gi	irls to cor	nplete the	puzzle.			(1)
1.2	Determine the lower and upper quartiles for the data.								(2)		
1.3	Draw a box and whisker diagram to represent the data.								(2)		
1.4	The five-number summary of the time (in seconds) taken by 19 boys to complete the same puzzle is $(15; 19; 23; 26; 30)$.										
	1.4.1	C	alculate	the interg	uartile ra	nge for tl	ne time ta	ken by the	e boys.		(2)
	1.4.2	i Ii o	f only on f the boys	e boy too s took at i	ok 19 seco least 19 s	onds to c econds to	omplete t complete	he puzzle e the puzz	, what pe le?	ercentage	(1)
1.5	In wl puzzl	hich gro le in less	up, the g than 23	girls or th seconds?	e boys, o Justify y	did a larg our answ	ger numbe er.	er of lear	ners com	plete the	(2) [10]

QUESTION 2

The table below shows information about the number of hours 120 learners spent on their cellphones in the last week.

NUMBER OF HOURS (<i>h</i>)	FREQUENCY
$0 \le h \le 2$	10
$2 \le h \le 4$	15
$4 < h \leq 6$	30
$6 < h \leq 8$	35
$8 \le h \le 10$	25
$10 \le h \le 12$	5

2.1 Identify the modal class for the data.

2.2 Estimate the mean number of hours that these learners spent on their cellphones in the last week.

(3) [4]

(1)

In the diagram, C is a point on the y-axis such that A(0; 4), B(4; -4), C and D(-4; 2) are vertices of parallelogram ABCD. K is the point $\left(0; -2\frac{1}{4}\right)$ and L is a point on AB such that KL || CB.



3.7	Write down, with reasons, the coordinates of C.	(3) [18]
3.6	Determine the equation of KL in the form $y = mx + c$.	(2)
3.5	Give a reason why parallelogram ABCD is a rectangle.	(1)
3.4	Prove that $AD \perp AB$.	(3)
3.3	Calculate the gradient of AD.	(3)
3.2	Calculate the coordinates of M, the midpoint of DB.	(3)
3.1	Calculate the length of diagonal DB.	(3)

4.2

 Δ PQR and Δ SQR are right-angled triangles as shown in the diagram below. PR = 26, PQ = 24, QS = 8, SR = 6, QR = 10 and PRQ = θ_{∞}



4.1 Refer to the diagram above and, WITHOUT using a calculator, write down the value of:

4.1.1	$\tan \hat{P}$		(1)
4.1.2	sin SQR		(1)
4.1.3	$\cos heta$		(1)
4.1.4	secSRQ		(1)
WITHOU	F using a calculator, determine the value of	$\frac{\cot\theta}{\csc Q\hat{R}S}$	(3)

(3) [7]

5.1 In the diagram below, P(x; y) is a point in the third quadrant. $\hat{ROP} = \beta$ and $17 \cos \beta + 15 = 0$.



5.1.1 Write down the values of x, y and r. (4)

5.1.2 WITHOUT using a calculator, determine the value of:

(a) $\sin\beta$ (1)

(b)
$$\cos^2 30^\circ . \tan \beta$$
 (3)

- 5.2 In each of the following equations, solve for x where $0^{\circ} \le x \le 90^{\circ}$. Give your answers correct to TWO decimal places.
 - 5.2.1 $\tan x = 2,22$ (2)

5.2.2
$$\sec(x+10^\circ) = 5,759$$
 (3)

5.2.3
$$\frac{\sin x}{0,2} - 2 = 1,24$$
 (3) [18]

In the diagram below, the graph of $f(x) = -2\cos x$ is drawn for the interval $0^{\circ} \le x \le 360^{\circ}$.



A concrete gate post comprises a right rectangular prism having a square base and a pyramid at the top, as shown in the diagram below. The length of the sides of the base is 30 cm and the height of the rectangular section is 150 cm. The perpendicular height of the pyramid section is 8 cm.





(3) Calculate the volume of concrete required to make ONE post. 7.1

(3) Calculate the surface area of the pyramid section of the post. 7.2

If the length of the sides of the base is halved, how many posts, having the same design as the original, can be made with the same volume of concrete as the 7.3 original post?

(2)

[8]

Give reasons for your statements in QUESTIONS 8 and 9.

QUESTION 8

8.2

In the diagram, ABCD is a rhombus having diagonals AC and BD intersecting in O. $A\hat{D}O = 36,87^{\circ}$ and DO = 8 cm.



8.1 Write down the sizes of the following angles:

8.1.1	CDO		(1)
8.1.2	AÔD		(1)
Calculate	the length of AO.		(2)

8.3 If E is a point on AB such that OE | DA, calculate the length of OE. (4) [8]

9.1 In the diagram below, D is the midpoint of side AB of $\triangle ABC$. E is the midpoint of AC. DE is produced to F such that DE = EF. $CF \parallel BA$.



In the diagram below, PQRS is a parallelogram having diagonals PR and QS 9.2 intersecting in M. B is a point on PQ such that SBA and RQA are straight lines and SB = BA. SA cuts PR in C and PA is drawn.



9.2.1	Prove that $SP = QA$.	(4)
9.2.2	Prove that SPAQ is a parallelogram.	(2)
9.2.3	Prove that $AR = 4MB$.	(4) [14]

TOTAL: 100

Memo

14	15	16	16	17	17	18	18	19	19
19	20	21	21	22	23	24	24	29	

1.1	Median/Mediaan = 19 seconds/sekondes	✓ answer/ <i>antw</i>
		(1)
1.2	Lower quartile/Onderste kwartiel (Q_{1}) = 17	$\checkmark Q_1$
	Upper quartile/Boonste kwartiel (Q_{3}) = 22	$\checkmark Q_3$
		(2)
1.3		
	• • • • • • • • • • • • • • • • • • • •	
		✓ box/mond
		✓ whiskers/ <i>snor</i>
	12 16 20 24 28 32	
		(2)
1.4.1	IQR/IKO = 26 - 19	$\checkmark Q_3 - Q_1$
	= 7	✓ answer/ <i>antw</i>
		(2)
1.4.2	75% of the boys took at least 19 seconds to complete the puzzle./	√ 75%
	75% van die seuns het ten minste 19 sekondes geneem om die	
	legkaart te voltooi.	(1)
1.5	About 50% but not more than 75% of the boys completed the	✓ relevant/ <i>relevante</i>
	puzzle in less than 23 seconds./Ongeveer 50% maar nie meer as	explanation/ver-
	75% van die seuns het die legkaart in minder as 23 sekondes	duideliking
	More than 75% of the girls completed the puzzle in less than 22 mere $1/5\%$ of the girls completed the puzzle in less than	
	23 seconds./Meer as 75% van die dogters het die legkaart in	a circle / de externe
	minuer as 25 sekonaes vollool.	• girls/aogiers
	23 seconds (Maar doctors hat due die lookaart in minder as	
	23 secondas voltooi	(2)

NUMBER OF HOURS GETAL UUR (h)	FREQUENCY FREKWENSIE
$0 < h \leq 2$	10
$2 < h \leq 4$	15
$4 < h \leq 6$	30
$6 < h \leq 8$	35
$8 < h \leq 10$	25
$10 < h \le 12$	5

2.1	The modal class is/ <i>Die modale klas is</i> $6 < h \le 8$	$\checkmark 6 < h \le 8 \tag{1}$
2.2	Average/Gemiddelde = $\frac{1 \times 10 + 3 \times 15 + \dots + 11 \times 5}{120}$ Estimated mean/Geskatte gemiddelde (\overline{x}) = $\frac{730}{120}$ = 6,08 hours/uur	 ✓ midpts/midpte ✓ 730 ✓ answer/antw (3) [4]



3.1	$DB = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$	✓ correct formula/ korrekte formule
	$=\sqrt{\left(-4-4\right)^2+\left(2-(-4)\right)^2}$	✓ subst
	$=\sqrt{64+36}$	
	$=\sqrt{100}$	✓ answer/ <i>antw</i>
	= 10	(3)
3.2	$M\left(\frac{x_{1}+x_{2}}{2} ; \frac{y_{1}+y_{2}}{2}\right)$	✓ correct formula/ korrekte formule
	$M\left(\frac{-4+4}{2} ; \frac{2-4}{2}\right)$ $\therefore M(0; -1)$	✓ x-value/waarde ✓ y-value/waarde (3)
3.3	$m_{\rm AD} = \frac{y_1 - y_2}{x_1 - x_2}$ $= \frac{4 - 2}{0 - (-4)}$ $= \frac{2}{4} = \frac{1}{2}$	 ✓ correct formula/ korrekte formule ✓ subst into/in gradient form/ gradiëntvorm ✓ answer/antw
		(3)

3.4	$m_{+D} = \frac{y_1 - y_2}{y_2}$	
	$m_{AB} - \frac{x_1 - x_2}{x_1 - x_2}$	
	$=\frac{4-(-4)}{0-4}$	✓ subst
	$=\frac{8}{-4}=-2$	✓ gradient of AB/ gradiënt van AB
	$\therefore m_{\rm AD} \times m_{\rm AB} = \frac{1}{2} \times -2 = -1$	$\checkmark m_{AD} \times m_{AB}$
	$\therefore AD \perp AB$	= -1 (3)
3.5	parallelogram with one internal angle = 90°	✓ R
	parallelogram met een binnehoek = 90°	(1)
3.6	$m_{\rm KL} = m_{\rm AD} = \frac{1}{2} \qquad [\rm KL \mid \mid \rm AD]$	\checkmark gradient of KL
	$\therefore y = \frac{1}{2}x - 2\frac{1}{4}$	$\checkmark \text{ equation/vgl} $
3.7	AC = DB = 10 units [diag of rectangle =/hkle v regh =]	✓ R (2)
	$4 - y_{\rm C} = 10$	✓ equation/vgl
	$y_{\rm C} = -6$	
	\therefore C(0; -6)	✓ answer/ <i>antw</i>
	OR/ <i>OF</i>	(3)
	$m_{\rm BC} = m_{\rm AD} = \frac{1}{2}$ [sides of rectangle /sye v regh]]	✓ R
	$\frac{-4 - y_{\rm C}}{4 - 0} = \frac{1}{2}$	✓ equation/vgl
	$-8-2y_{\rm C}=4$	
	$y_{\rm C} = -6$	
	\therefore C(0; -6)	\checkmark answer/antw (3)
		[18]



4.1.1	$\tan \hat{\mathbf{P}} = \frac{10}{24} = \frac{5}{12}$	Accept answers as unsimplified fractions.	✓ answer/ <i>antw</i>	(1)
4.1.2	$\sin \hat{SQR} = \frac{6}{10} = \frac{3}{5}$		✓ answer/ <i>antw</i>	(1)
4.1.3	$\cos \theta = \frac{10}{26} = \frac{5}{13}$	Aanvaar antwoorde as nie- vereenvoudigde breuke.	✓ answer/ <i>antw</i>	(1)
4.1.4	$\operatorname{sec} \ \mathrm{S}\widehat{\mathrm{R}}\mathrm{Q} = \frac{10}{6} = \frac{5}{3}$		✓ answer/ <i>antw</i>	(1)
4.2	$\frac{\cot \theta}{\csc \ Q\hat{R}S}$ $= \frac{10}{24} \div \frac{10}{8}$ $= \frac{1}{3}$		$\checkmark \frac{10}{24} \checkmark \frac{10}{8}$ $\checkmark \frac{1}{3}$	(3) [7]



5.1.1	x = -15	✓ <i>x</i> -value/ <i>waarde</i>
	r = 17	✓ <i>r</i> -value/ <i>waarde</i>
	$x^2 + y^2 = r^2$	
	$(-15)^2 + y^2 = 17^2$	✓ using/gebruik Pyth
	$y^2 = 64$	
	y = -8	\checkmark <i>y</i> -value/ <i>waarde</i> (4)
5.1.2(a)	$\sin \theta = \frac{8}{3}$	✓ answer/ <i>antw</i>
	$\sin p = -\frac{1}{17}$	(1)
5.1.2(b)	$\cos^2 30^\circ$. $\tan \beta$	—
	$\left(\sqrt{3}\right)^2 - 8$	$\sqrt{\frac{\sqrt{3}}{3}}$
	$=\left(\frac{1}{2}\right)\cdot\frac{1}{-15}$	2
	3 8	$\sqrt{\frac{-6}{15}}$
	$=\frac{5}{4}\times\frac{6}{15}$	-13
	2	✓ answer/ <i>antw</i>
	$=\frac{-}{5}$	(3)
5.1.3	$\hat{P} = 180^\circ + 28.07^\circ$	\checkmark ref/verw/
	$= 208.07^{\circ}$	\checkmark answer/ <i>antw</i> (2)
5.2.1	$\tan x = 2,22$	
	$x = 65,75^{\circ}$	$\checkmark \checkmark$ answer/ <i>antw</i>
5.0.0		(2)
5.2.2	$\sec(x+10^{\circ}) = 5,759$	1
	$\cos(x+10^\circ) = 0,173 \text{ OR/}OF \ \cos(x+10^\circ) = \frac{1}{5,759}$	$\checkmark \cos(x+10^\circ) = \frac{1}{5,759}$
	$x + 10^{\circ} = 80,0^{\circ}$	✓ ref/verw /
	$x = 70,0^{\circ}$	✓ answer/ <i>antw</i>
		(3)
5.2.3	$\frac{\sin x}{0,2} - 2 = 1,24$	
	$\sin x$ 2.24	Vaddition/antalling
	$\overline{0,2} = 3,24$	
	$\sin x = 0,648$	✓ multipl/vermenigv
	$x = 40,39^{\circ}$	✓ answer/ <i>antw</i>
		(3)
		[[18]

6.1	amplitude = 2	\checkmark answer/ <i>antw</i>
6.2	min value/waarde = -2 + 3 = 1	
6.3	$ \begin{array}{c} $	✓ y-intercept/afsnit ✓ $(90^\circ; 2)$ ✓ $(270^\circ; 0)$
6.4.1	$f(180^{\circ}) - g(180^{\circ}) = 2 - 1 = 1$	(3) ✓ correct values/ <i>korrekte waardes</i> ✓ answer/ <i>antw</i> (2)
6.4.2	$x \in (90^\circ; 270^\circ)$ OR / <i>OF</i> $90^\circ < x < 270^\circ$	✓ correct values/ korrekte waardes ✓ notation/notasie (2)
6.5.1	$f(x) = 2\cos x - 3$	$\checkmark \checkmark$ answer/ <i>antw</i> (2)
6.5.2	$y \in [-5; -1]$ OR / <i>OF</i> $-5 \le y \le -1$	$\begin{array}{c} (2) \\ \checkmark \checkmark \text{ answer/antw} \\ (2) \\ \end{array}$
		[13]



7.1	Vol of post = vol of rectangle + vol of pyramid	✓ sum of formulae/
	= area of base \times h + $\frac{1}{3}$ area of base \times h	som v formules
	Vol van pilaar = vol v reghoek + vol v piramide	
	$= oppervl \ v \ basis \ \times \ h + \frac{1}{3} \ oppervl \ v \ basis \ \times \ h$	
	$Volume = (30 \times 30 \times 150) + \left(\frac{1}{3}(30 \times 30 \times 8)\right)$	✓ subst into/ <i>in</i> both/ <i>beide</i> formulae
	$= 137400 \text{ cm}^{3}$	✓ answer/ <i>antw</i>
7.2		(3)
1.2	Stant height of pyramid/Skuinshoogte van piramide	
	$=\sqrt{8^2+15^2}$	
	=17	✓ 17
	Total surface area of pyramid = area of base + $\frac{1}{2}$ (perimeter of base × slant height)	
	Surface area of pyramid section = $4 \times \left(\frac{1}{2} \times 30 \times 17\right)$	
	$=1020 \text{ cm}^2$	
	Totale buite-oppervlakte van 'n piramide	
	= oppervl v basis + $\frac{1}{2}$ (omtrek v die basis × skuinshoogte)	
	Surface area of pyramid section/Buite-opp van piramide gedeelte	√ subst into/ <i>in</i>
	$=4 \times \left(\frac{1}{2} \times 30 \times 17\right)$	correct/ <i>korrekte</i> form
	$=1020 \text{ cm}^2$	\checkmark answer/antw (3)

		1	
7.3	Volume (new) = $\frac{1}{4}$ (137400)		
	$= 34350 \text{ cm}^3$	✓ 34 350	
	Number of smaller posts that can be made = $\frac{137400}{34350}$		
	= 4	√ 4	(2)
	Volume (nuwe) = $\frac{1}{4}$ (137400)		(2)
	$= 34350 \text{ cm}^3$		
	Getal kleiner pilare wat gemaak kan word = $\frac{137400}{34350}$		
	=4		
	OR/OF		
	Volume (nuwe) = $(15 \times 15 \times 150) + (\frac{1}{3}(15 \times 15 \times 8))$		
	$= 34 \ 350 \ \mathrm{cm}^3$	✓ 34 350	
	Getal kleiner pilare wat gemaak kan word = $\frac{137400}{34350}$		
	= 4	√ 4	
	Volume (new) = $(15 \times 15 \times 150) + (\frac{1}{3}(15 \times 15 \times 8))$		(2)
	$= 34350 \ cm^3$		
	Getal kleiner pilare wat gemaak kan word = $\frac{137400}{34350}$		
	= 4		[8]



8.1.1	$\hat{CDO} = 36,87^{\circ}$	✓ answer/ <i>antw</i>
		(1)
8.1.2	$\hat{AOD} = 90^{\circ}$	✓ answer/ <i>antw</i>
		(1)
8.2	$\tan 36.87^{\circ} - AO$	$\sqrt{\tan 36.87^\circ} - \frac{AO}{AO}$
	$\frac{1}{8}$	8
	$AO = 8 \times \tan 36,87^{\circ}$	
	= 6 cm	✓ answer/ <i>antw</i>
		(2)
8.3	$AD^2 = 8^2 + 6^2$ [Theorem of Pythagoras/se	
	- 100 stelling]	
	-100 81	\checkmark AD = 10 with
	AD = 10	reason/met rede
	AE = EB [converse midpoint theorem/omgekeerde midptst]	\checkmark S \checkmark R
	$OE = \frac{1}{2}AD = 5 \text{ cm}$ [midpoint theorem/midptst]	✓ 5 cm
	2	(4)
		[8]

9		1
-	٠	



9.1.1	Two sides and an included ar	ngle/Twee sye en 'n ingeslote hoek	✓ R	
				(1)
9.1.2	one pr of sides = and		✓ R	
	$een \ pr \ sye = en$			(1)
9.1.3	$DE = \frac{1}{2}DF$	[DE = EF]	✓ S	
	DF = BC	[opp sides of parm/tos sye v parm =]	✓S	
	$\therefore DE = \frac{1}{2}BC$			
	2			(2)



9.2.1	In ΔSAR,		
	SB = BA	[given/gegee]	
	QR = QA	[converse midpoint th/omgekeerde midptst]	$\checkmark S \checkmark R$
	But/maar QR= SP	[opp sides of parm =/tos sye v parm=]	$\checkmark S \checkmark R$
	\therefore SP = QA		(4)
9.2.2	SP = QA	[proven/bewys]	✓ both statements/
	SP QA	[opp sides of parm /tos sye v parm]	beide bewerings
	∴ SPAQ is a parm	[one pr of sides = and $ /een pr sye = en $]	√R
			(2)
9.2.3	M midpoint of/midpt	<i>van</i> PR and/ <i>en</i>	
	B midpoint of/ <i>midpt</i>	<i>van</i> PQ [diag bisect of parm/ <i>hkle halveer parm</i>]	✓S
	$MP = {}^{1}OP$	[midpoint theorem/midptst]	✓ S ✓ R
	$\frac{1}{2}$		
	1(1)		$\sqrt{OR} - \frac{1}{2}AR$
	$MB = \frac{1}{2} \left(\frac{1}{2} AR \right)$		2^{11}
	$\therefore 4MB = AK$		(4)
			[14]

TOTAL/TOTAL: 100