GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

NOVEMBER 2023

GRADE 11

MARKING GUIDELINES

MATHEMATICS (PAPER 2)

14 pages

EXEMPLAR

INSTRUCTIONS AND INFORMATION

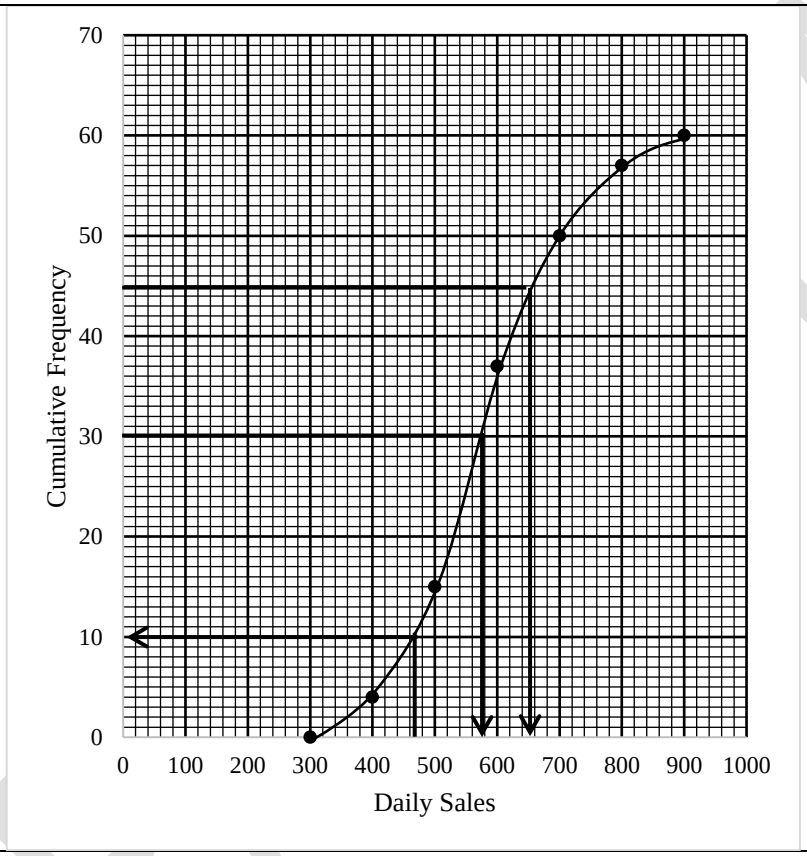
- **A** – ACCURACY
- **CA** – CONSISTENT ACCURACY
- S – STATEMENT
- R – REASON
- S & R – STATEMENT with REASON

NOTES:

- If a candidate answered a question TWICE, mark only the first attempt.
- If a candidate crossed OUT an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a question is UNACCEPTABLE.

EXEMPLAR

QUESTION 1

1.1	Class interval	Frequency	Cumulative frequency	✓ Frequency values ✓ Cumulative frequency values	(2)
	$300 < x \leq 400$	4	4		
	$400 < x \leq 500$	11	15		
	$500 < x \leq 600$	22	37		
	$600 < x \leq 700$	13	50		
	$700 < x \leq 800$	7	57		
	$800 < x \leq 900$	3	60		
1.2				✓ (300 ; 0) ✓ End points ✓ Shape	(3)
1.3	Q_2 = R580			✓✓ Answer Accept R560 to R600	(2)
1.4	On 10 days they made a loss. ∴ 50 days they made a profit.			✓✓ Answer	(2)
1.5	To be in the top 25% of the previous months, the tuck shop would need to have sold more than R650. Therefore, R725 would have been in the top 25%.			✓ R650 ✓ Conclusion	(2)
					[11]

QUESTION 2

2.1	$\frac{2k+k+1+k+2+k-3+2k-2}{5} = 15$ $\frac{7k-2}{5} = 15$ $7k - 2 = 75$ $7k = 77$ $k = 11$	✓ $7k - 2$ ✓ Divide by 5 ✓ Manipulation	(3)
2.2	22 ; 12 ; 13 ; 8 ; 20 $\sigma = 5{,}22$	✓✓ Answer	(2)
2.3	Mean would decrease by *t* units but the standard deviation would be unaffected.	✓ Mean decreases by *t* units ✓ Standard deviation unaffected	(2)
			[7]

QUESTION 3

3.1	$m_{MQ} = \frac{0-(-2)}{-2-(-4)}$ $m_{MQ} = -\frac{1}{3}$	✓ Substitution into correct formula ✓ Answer	(2)
3.2	$m_{MQ} \times -\frac{1}{3} = -1$ MP ⊥ MQ $m_{MP} = 3$ $y = 3x + 6$	✓ Perpendicular gradients ✓ Gradient of MP ✓ Answer	(3)
3.3	$-2 = \frac{x_R + 4}{2}$ $0 = \frac{y_R + (-2)}{2}$ $x_R = -8$ $y_R = 2$ R (–8 ; 2)	✓ Substitution into midpoint formula ✓ x_R ✓ y_R	(3)

EXEMPLAR

3.4	PQ = $\sqrt{(0-4)^2+(6-(-2))^2}$ PQ = $\sqrt{80}$ PQ = $4\sqrt{5}$	✓ Substitute into distance formula ✓ Simplified surd	(2)
3.5	E(–4 ; –6)	✓ $x_E = -4$ ✓ $y_E = -6$	(2)
3.5	The diagonals of the parallelogram are perpendicular.	✓ Diagonals perpendicular ✓ Given parallelogram	(2)
			[14]

QUESTION 4

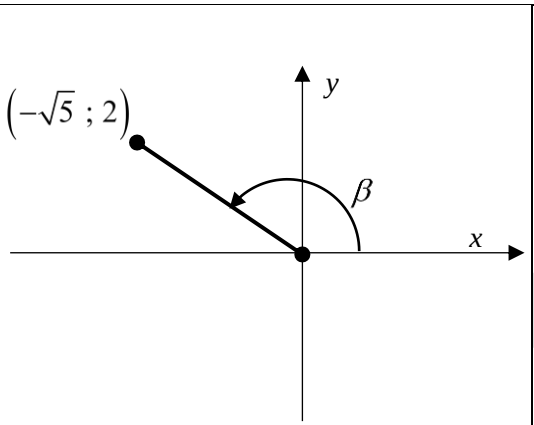
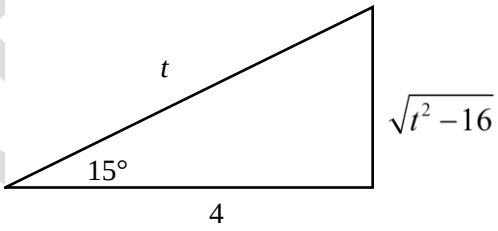
4.1	subst. $x = 0$ $py - x - 5p = 0$ $py - (0) = 5p$ $y = \frac{5p}{p}$ $y = 5$ C(0 ; 5)	✓ $x = 0$ ✓ Manipulation ✓ $x = 5$	(3)
4.2	$py - x - 5p = 0$ $py = x + 5p$ $y = \frac{x}{p} + 5$ $m_{AC} = \frac{1}{2}$ $\therefore \frac{1}{p} = \frac{1}{2}$ $\therefore p = 2$ **OR** A(–10 ; 0) $m_{AC} = \frac{1}{2}$ $p(0) - (-10) - 5p = 0$ $10 = 5p$ $p = 2$	✓ Standard form ✓ Equate gradients ✓ A (–10 ; 0) ✓ Substitute A	(2)

EXEMPLAR

4.3	Equation of AC: $2y - x - 10 = 0$ $y = \frac{1}{2}x + 5$ Equation of BD: $y = -2x - 10$ $\frac{1}{2}x + 5 = -2x - 10$ $x + 10 = -4x - 20$ $5x = -30$ $x = -6$ $y = 2$ $\therefore$ B(–6 ; 2)	✓ Substitute $p = 2$ ✓ Equation of BD ✓ Substitute y into other equation ✓ $x = -6$ ✓ $y = 2$	(5)
4.4	$\tan\alpha = \frac{1}{2}$ $\alpha = 26{,}57°$	✓ Substitution into correct formula ✓ Answer	(2)
4.5	$A\hat{C}D = 63{,}43°$ int ∠'s of Δ $\beta = 26{,}56°$ int ∠'s of Δ $\therefore\ \alpha = \beta$ $\therefore$ ABOD is a cyclic quadrilateral (converse ∠'s in same segment)	✓ $A\hat{C}D$ ✓ β ✓ Rede	(3)
4.6	DB is a diameter (line subtends 90°) $M_{CD} = \left(\frac{0+0}{2}; \frac{5+(-10)}{2}\right)$ $= M_{CD}\left(0; -\frac{5}{2}\right)$	✓ $x = 0$ ✓ $y = -\frac{5}{2}$	(2)
			[17]

EXEMPLAR

QUESTION 5

5.1	5.1.1	$\sin\beta = \frac{2}{3}$ $x^2 + (2)^2 = 3^2$ $x = -\sqrt{5}$ $3\cos^2\beta - 1$ $=3\left(\frac{\sqrt{5}}{3}\right)^2 - 1$ $= \frac{5}{3} - 1$ $= \frac{2}{3}$  	✓ Quadrant II ✓ $x = -\sqrt{5}$ ✓ Substitute $\cos\beta$ ✓ Answer	(4)
	5.1.2	$\tan(-\beta - 180°)$ $= -\tan\beta$ $= -\left(\frac{2}{-\sqrt{5}}\right)$ $= \frac{2}{\sqrt{5}}$	✓ $-\tan\beta$ ✓ Substitution ✓ Answer	(3)
5.2	5.2.1	$t\cos 15° = 4$ $\cos 15° = \frac{4}{t}$ $\sin 15°$ $= \frac{\sqrt{t^2 - 16}}{t}$  	✓ $\cos 15° = \frac{t}{4}$ ✓ $\sqrt{t^2 - 16}$ ✓ t	(3)
	5.2.2	$\sin 75°$ $= \cos 15°$ $= \frac{4}{t}$	✓ Complement ✓ Answer	(2)

EXEMPLAR

	5.2.3	$1 - \tan^2 15°$ $= 1 - \left(\frac{\sqrt{t^2-16}}{4}\right)^2$ $= 1 - \frac{t^2-16}{16}$ $= \frac{16-t^2+16}{16}$ $= \frac{32-t^2}{16}$	✓ $\left(\frac{\sqrt{t^2-16}}{4}\right)^2$ ✓ $\frac{t^2-16}{16}$ ✓ Correct multiplication by LCD	(3)
5.3	$\frac{\cos(90° - \alpha)\sin(-\alpha - 540°)}{\tan 225° + \sin\alpha.\sin(180° + \alpha)}$ $= \frac{\sin\alpha.\sin\alpha}{\tan 45° + (\sin\alpha.)(-\sin\alpha)}$ $= \frac{\sin^2\alpha}{1-\sin^2\alpha}$ $= \frac{\sin^2\alpha}{\cos^2\alpha}$ $= \tan^2\alpha$		✓ $\tan 45°$ ✓ $\sin\alpha.-\sin\alpha$ ✓ $\sin\alpha.\sin\alpha$ ✓ $1 - \sin^2\alpha$ ✓ $\frac{1}{\tan^2\alpha}$	(5)
5.4	5.4.1	$1 - \cos\theta = 2\sin^2\theta$ $1 - \cos\theta = 2(1 - \cos^2\theta)$ $1 - \cos\theta = 2 - 2\cos^2\theta$ $2\cos^2\theta - \cos\theta - 1 = 0$ $(2\cos\theta + 1)(\cos\theta - 1) = 0$	✓ $2(1 - \cos^2\theta)$ ✓ standard form	(2)
	5.4.2	$2\cos\theta + 1 = 0$ or $\cos\theta - 1 = 0$ $\cos\theta = -\frac{1}{2}$ or $\cos\theta = 1$ RA = 60° or $\theta = 0° + K.360°$; K ε ℤ QII : $\theta = 120° + K.360°$; K ε ℤ QIII : $\theta = 240° + K.360°$; K ε ℤ	✓ $\cos\theta = -\frac{1}{2}$ ✓ $\cos\theta = 1$ ✓ Both solutions for $\cos\theta = -\frac{1}{2}$ ✓ $\theta = 0° + K.360°$ ✓ + K ε ℤ	(5)
				[27]

EXEMPLAR

QUESTION 6

6.1	180°		✓ Answer	(1)
6.2	$-\frac{1}{2} \le y \le \frac{1}{2}$		✓ Endpoints ✓ Notation	(2)
	6.3.1	$45° \le x \le 90°$	✓ $x \ge 45°$ ✓ $x < 90°$	(2)
	6.3.2	$-90° < x < -45°$ or $90° < x < 135°$	✓ $-90° < x < -45°$ ✓ $90° < x < 135°$	(2)
	6.3.3	$2\tan x + \cos 2x = 2$ $2\tan x - 2 = -\cos 2x$ $\tan x - 1 = -\frac{1}{2}\cos 2x$ $\therefore f(x) = g(x)$ where $x = 45°$	✓ $2\tan x - 2 = -\cos 2x$ ✓ $\tan x - 1 = -\frac{1}{2}\cos 2x$ ✓ Value of x	(3)
6.4	$h(x) = \frac{\sin x + \cos x}{\cos x}$ $h(x) = \frac{\sin x}{\cos x} + 1$ $h(x) = \tan x + 1$ $h(x) = f(x) + 2$ $\therefore$ Vertical translation up by 2 units		✓ $\tan x + 1$ ✓ Up by 2 units	(2)
6.5	$p(x) = 4\left(-\frac{1}{2}\cos 2x\right)$ $p(x) = -2\cos 2x$ $\therefore$ Maximum value of 2		✓ $-2\cos 2x$ ✓ Max of 2	(2)
				[14]

EXEMPLAR

QUESTION 7

7.1	$\tan p = \frac{1}{3}$ $p = 18{,}435°$	✓ $\tan p = \frac{1}{3}$ ✓ Value of p to 3 decimal places	(2)
7.2	In ΔBCD $\frac{CD}{\sin\left(\frac{18{,}4°}{2}\right)} = \frac{121}{\sin 135°}$ $CD = \frac{121 \times \sin 9{,}2^\circ}{\sin 135}$ $CD = 27{,}36\ m$	✓ Correct substitution into sine rule ✓ Manipulation ✓ Length of CD	(3)
			[5]

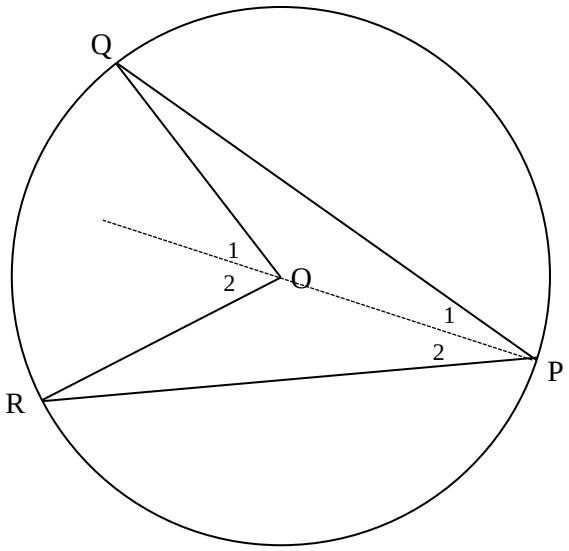
QUESTION 8

8.1	$V = x^2h$ $490 = x^2h$ $h = \frac{490}{x^2}$	✓ Substitute into volume formula ✓ h in terms of x	(2)
8.2	$A = x^2 + 4xh$ $A = x^2 + 4x\left(\frac{490}{x^2}\right)$ $A = x^2 + \frac{1960}{x}\ cm^3$	✓ Base of x^2 ✓ $4x\left(\frac{490}{x^2}\right)$	(2)
8.3	$10 = \frac{490}{x^2}$ $x^2 = 49$ $x = 7 \qquad (x > 0)$ $A = (7)^2 + \frac{1\ 960}{7}$ $A = 329\ cm^2$	✓ Substitute $h = 10$ ✓ $x^2 = 49$ ✓ $x = 7$ ✓ Surface area	(4)
			[8]

EXEMPLAR

QUESTION 9

9.1



Join PO and extend		✓ Construction
In ΔPOQ		
$\hat{O}_1 = \hat{Q} + \hat{P}_1$	ext $\angle$ of Δ	✓ SR
but $\hat{Q} = \hat{P}_1$	$\angle's$ opp equal radii	✓ SR
$\therefore \hat{O}_1 = 2\hat{P}_1$		✓ S
Similarly in ΔROQ		
$\hat{O}_2 = 2\hat{P}_2$		✓ S
$\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{P}_1 + 2\hat{P}_2$		✓ S
$\hat{O}_1 + \hat{O}_2 = 2(\hat{P}_1 + \hat{P}_2)$		
$\therefore R\hat{O}Q = 2\hat{P}$		(6)

9.2	9.2.1 (a)	$\hat{D} = 55°$	$\angle's$ in the same segment	✓ S ✓ R (2)
	(b)	$\hat{O}_2 = 110°$	$\angle$ at centre $= 2\times$ $\angle$ at circumference	✓ S ✓ R (2)
	(c)	$\hat{E}_2 = 110° - 90°$ $\hat{E}_2 = 20°$	ext $\angle$ of Δ	✓ R ✓ S (2)

EXEMPLAR

	(d)	$\hat{E}_1 = 35°$	int $\angle's$ of Δ	✓ R ✓ S ✓ R	
		$\hat{E}_3 = 35°$	$\angle's$ in a semi-circle		
		OR			
		$\hat{E}_3 = \hat{F}_1$	$\angle's$ opp equal radii	✓ S ✓ R ✓ SR	
		$\hat{E}_3 = 35°$	int $\angle's$ of Δ		(3)
	9.2.2	OE = 5	equal radii	✓ SR	
		HE = 4,7	line from centre perpendicular to chord	✓ S ✓ R	
		$OH^2 = 5^2 - (4,7)^2$	Pythagoras' Theorem	✓ S	
		OH = 1,71 units			
		OR			
		OE = 5	radii	✓ SR	
		$\sin 20° = \frac{OH}{5}$		✓✓ sin 20° ✓ OH	
		OH = 1,71 units			
		OR			
		HE = 4,7	line from centre perpendicular to chord	✓ S ✓ R ✓ tan 20°	
		$\sin 20° = \frac{OH}{4,7}$		✓ OH	
		OH = 1,71 units			(4)
					[19]

QUESTION 10

10.1	$\hat{B}_1 = x$	alt. $\angle's$, AC ⫼ TV	✓ S ✓ R	
	$\hat{V}_1 = x$	$\angle's$ opp equal sides	✓ S ✓ R	
	$\hat{T}_2 = x$	tan chord theorem	✓ S ✓ R	(6)
10.2	$\hat{A} = 2x$	opp $\angle's$ parm	✓ S ✓ R	
	$\hat{B}_3 = 2x$	ext $\angle$ cyclic quad	✓ S ✓ R	
	$\therefore \hat{A} = B_3$	both equal $2x$	✓ R	
	AT = BT	sides opp equal $\angle's$		

EXEMPLAR

	OR $\hat{B}_3 = 2x$ $\hat{T}_1 = 2x$ $\therefore \hat{T}_1 = \hat{V}_1 + \hat{V}_2$ $\therefore$ BTVC is an isosceles trapezium (one pair parallel sides and one pair of base angles equal) $\therefore$ CV = BT en CV = AT $\therefore$ AT = BT	ext $\angle$ cyclic quad alt $\angle$'s, AC $\Vert\Vert$ TV both equal 2*x* sides of isos trap opp sides parm	✓ S ✓ R ✓ SR ✓ S ✓ R ✓ Logic	(5)
10.3	In ΔATB, 5*x* = 180° *x* = 36°	int $\angle$'s of Δ	✓ R ✓ S	(2)
				[13]

QUESTION 11

11.1	$\hat{D}_3 = \hat{H}_1 + \hat{E}_1$	ext $\angle$ of Δ	✓ S	(1)
11.2	$\hat{D}_3 = \hat{H}_1 + \hat{E}_1$ $\hat{H}_1 = \hat{F}_2$ and $\hat{E}_1 = \hat{F}_1$ $\therefore \hat{D}_3 = \hat{F}_1 + \hat{F}_2$ $\therefore$ DEFH is a cyclic quadrilateral (ext $\angle$ = opp int $\angle$)	ext $\angle$ of Δ tan chord theorem tan chord theorem	✓ S ✓ R ✓ SR ✓ R (with $\left(\hat{D}_3 = \hat{F}_1 + \hat{F}_2\right)$	(4)
11.3	$\hat{H}_1 = \hat{F}_2$ $\hat{H}_1 = \hat{F}_1$ $\therefore \hat{F}_1 = \hat{F}_2$	*tan chord theorem* *$\angle$'s in the same segment*	✓ SR ✓ S ✓ R	(3)

EXEMPLAR

11.4	$\hat{H}_3 + \hat{H}_4 = \hat{E}_1 + \hat{E}_2$	ext $\angle$ cyclic quad	✓ S ✓ R	
	$\hat{H}_4 = \hat{K}_1$	tan chord theorem	✓ SR	
	$\hat{H}_3 = \hat{K}_2$	$\angle's$ in the same circle segment	✓ S ✓ R	
	$\therefore \hat{K}_1 + \hat{K}_2 = \hat{E}_1 + \hat{E}_2$			
	$\hat{K}_1 = \hat{E}_1$	given	✓ S	
	$\therefore \hat{K}_2 = \hat{E}_2$			
	$\therefore$ KF is a tangent	converse tan chord theorem	✓ R (if $\hat{K}_2 = \hat{E}_2$ proven)	(7)
				[15]

TOTAL: 150

EXEMPLAR