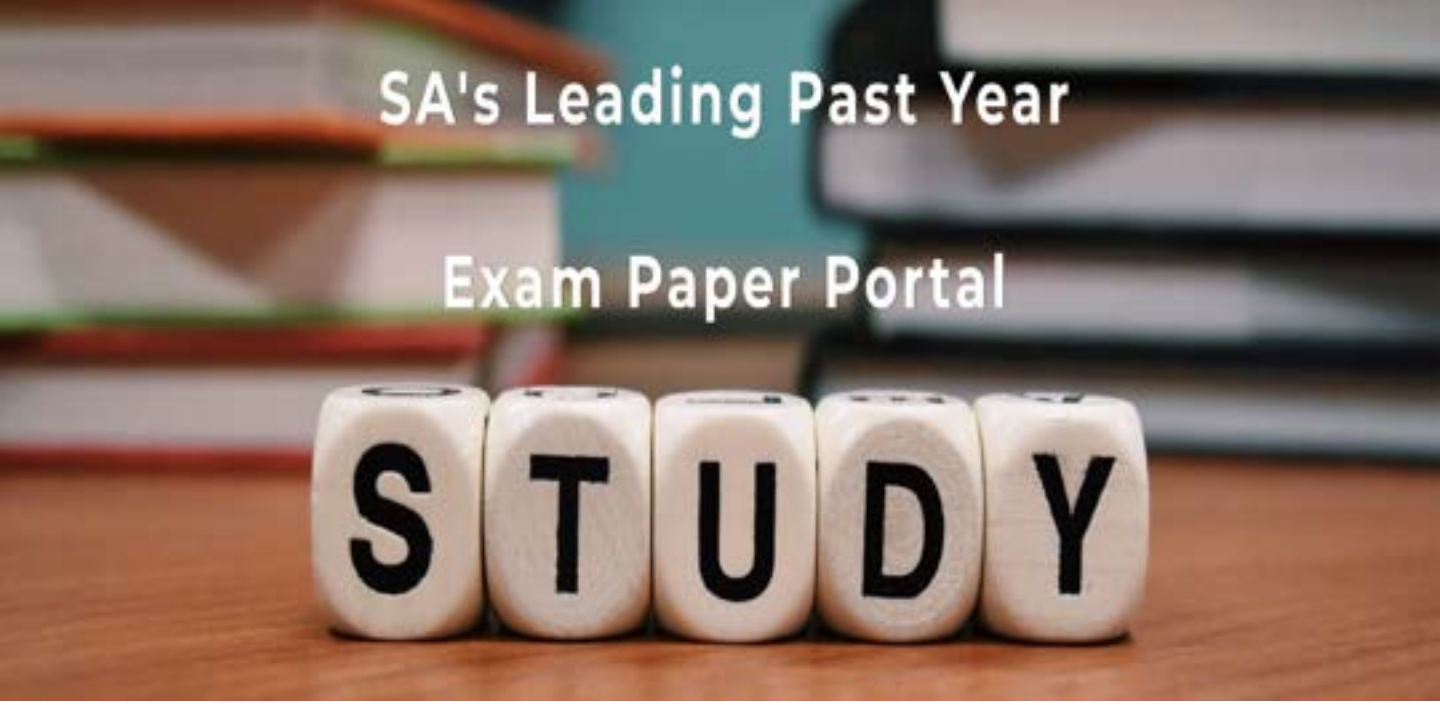


GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

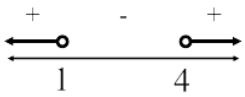
2020

MARKING GUIDELINES

MATHEMATICS P1 (10611)

17 pages

QUESTION 1

1.1.1	$3x^2 + 5x = 7$ $3x^2 + 5x - 7 = 0$ $x = \dfrac{-5 \pm \sqrt{5^2 - 4(3)(-7)}}{2(3)}$ $x = \dfrac{-5 \pm \sqrt{109}}{6}$ $x = 0{,}91$ **or** $x = -2{,}57$ **PENALIZE 1 MARK FOR INCORRECT ROUNDING IN THIS QUESTION ONLY.**	✓ standard form ✓ subst. into correct formula ✓ ✓answers (4)
1.1.2	$2x^2 = 9x + 5$ $2x^2 - 9x - 5 = 0$ $(2x+1)(x-5) = 0$ $x = -\dfrac{1}{2}$ **or** $x = 5$ **ANY OTHER VALID METHOD**	✓ standard form ✓ factors ✓ both answers correct (3)
1.1.3	$x^2 - 5x > -4$ $x^2 - 5x + 4 > 0$ $(x-4)(x-1) > 0$  **OR**  $x < 1$ or $x > 4$	✓ standard form ✓ factors ✓ critical values ✓ both correct answers (4)

1.1.4	$x-3x^{\frac{1}{2}}=4$ $x-4=3\sqrt{x}$ $x^2-8x+16=9x$ $x^2-17x+16=0$ $(x-16)(x-1)=0$ $x=16$ **OR** $x\neq 1$ N/A	✓ isolating $3\sqrt{x}$ ✓ squaring both sides ✓ standard form ✓ factors ✓ critical values ✓ selection/rejection (6)
1.2	$2^{2x+1}+7.2^x-4=0$ let $2^x=k$ $\therefore\ 2k^2+7k-4=0$ $(2k-1)(k+4)=0$ $k=\frac{1}{2}$ **OR** $k=-4$ $\therefore\ 2^x=2^{-1}$ $\quad 2^x\neq -4$ $x=-1$ $\quad$ Not a solution	✓ standard form ✓ factors ✓ critical values ✓ rejection of 1 answer (4)
1.3	$x=y-13$ ... (1) and $\sqrt{2-x}=y-3$...(2) sub (1) into (2) $\sqrt{2-(y-13)}=y-3$ $\sqrt{15-y}=y-3$ $15-y=y^2-6y+9$ $0=y^2-5y-6$ $0=(y-6)(y+1)$ $y=6$ **OR** $y\neq -1$ $x=-7$ **OR**	✓ substitution ✓ square both sides ✓ standard form ✓ factors ✓ y-values ✓ x-value **OR**

	$x = y - 13$ and $\sqrt{2-x} = y - 3$ $\therefore y = x + 13$ ... (1) $\quad \sqrt{2-x} = y - 3$ ... (2) Sub for y into equation 2 $\sqrt{2-x} = x + 13 - 3$ $\sqrt{2-x} = x + 10$ $2 - x = x^2 + 20x + 100$ $0 = x^2 + 21x + 98$ $0 = (x+14)(x+7)$ $x = -14$ **OR** $x = -7$ $y \neq -1$ **OR** $y = 6$	✓ substitution ✓ square both sides ✓ standard form ✓ factors ✓ x-values ✓ y-values (6)
		[27]

QUESTION 2

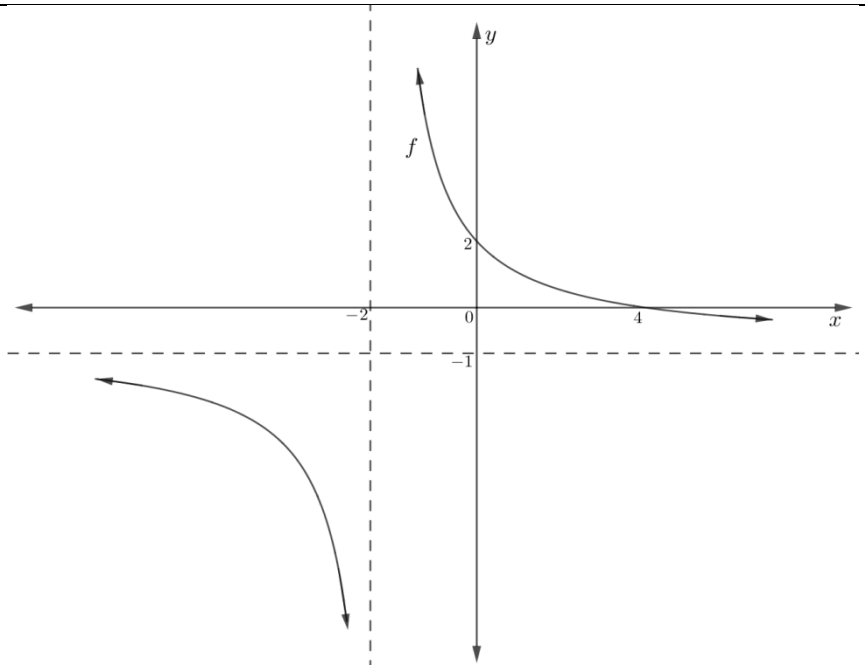
2.1.1	37	✓answer (1)
2.1.2	1 ; 7 ; 15 6 8 2 $2a = 2$ $a = 1$ $3a + b = 6$ $3(1) + b = 6$ $b = 3$ $a + b + c = 1$ $1 + 3 + c = 1$ $c = -3$ $T_n = n^2 + 3n - 3$	✓ second difference ✓ $a = 1$ ✓ $b = 3$ ✓ $c = -3$ (4)
2.1.3	$W_n = 2n + 4$ $50 = 2n + 4$ $46 = 2n$ $n = 23$ $T_{23} = 23^2 + 3(23) - 3$ $= 595$	✓ $W_n = 2n + 4$ ✓ equating to 50 ✓ $n = 23$ ✓ substitution ✓ answer (5)
2.2.1	$T_{191} = 0$	✓answer (1)
2.2.2	$-\frac{1}{2}$; $\frac{1}{2}$; $\frac{3}{2}$.... 250 terms $d = 1$ $S_{250} = \frac{250}{2}\left[2\left(-\frac{1}{2}\right) + (250-1)(1)\right]$ $S_{250} = 31000$ $\therefore 0 + -\frac{1}{2} + 0 + \frac{1}{2} + 0 + \frac{3}{2}$... to 500 terms $S_{500} = 31000$	✓ value of d ✓ correct sub. into correct formula ✓ S_{250} = 31 000 ✓ answer (4)

2.3	$r = 2\left(\frac{1-k}{5}\right)$ $\therefore -1 < 2\left(\frac{1-k}{5}\right) < 1$ $-\frac{1}{2} < \left(\frac{1-k}{5}\right) < \frac{1}{2}$ $-\frac{5}{2} < 1-k < \frac{5}{2}$ $-\frac{7}{2} < -k < \frac{3}{2}$ $-\frac{3}{2} < k < \frac{7}{2}$	✓ r ✓ $-1 < r < 1$ ✓ correct critical values ✓ answer (4)
		[19]

QUESTION 3

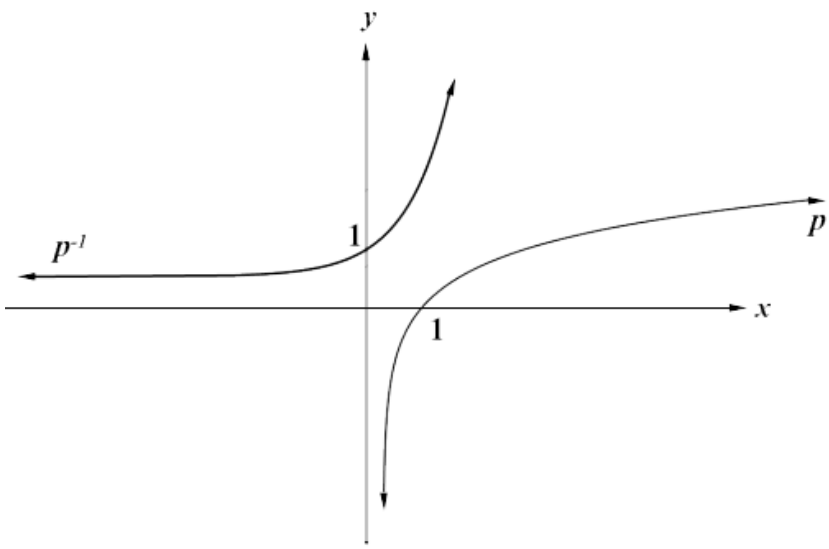
3.1	$S_n > 31$ $\therefore \dfrac{16\left(1-\left(\frac{1}{2}\right)^n\right)}{1-\left(\frac{1}{2}\right)} > 31$ $\left(1-\left(\frac{1}{2}\right)^n\right) > \frac{31}{32}$ $-\left(\frac{1}{2}\right)^n > -\frac{1}{32}$ $-\left(\frac{1}{2}\right)^n > -\left(\frac{1}{2}\right)^5$ $\therefore\ n > 5$ or $n \geq 6$ **ANSWER ONLY: FULL MARKS**	✓ correct substitution into correct formula ✓ simplification $(-\frac{1}{32})$ ✓ correct answers (3)
3.2	$S_\infty = \dfrac{a}{1-r}$ $S_\infty = \dfrac{16}{1-\frac{1}{2}}$ $S_\infty = 32$	✓correct substitution into correct formula ✓ answer (2)
		[5]

QUESTION 4

4.1	$x=-2$ $y=-1$	✓answer ✓answer (2)
4.2.1	$y=\frac{6}{0+2}-1$ $y=2$	✓ $x=0$ ✓ answer (2)
4.2.2	$0=\frac{6}{x+2}-1$ $1=\frac{6}{x+2}$ $x+2=6$ $x=4$	✓ $y=0$ ✓ answer (2)
4.3		✓ shape ✓ asymptotes ✓ x -and y-intercepts (3)

4.4	$y = -(x+2) - 1$ $y = -x - 3$ **OR** $y = mx + c$ $-1 = -1(-2) + c$ $-3 = c$ $\therefore\ y = -x - 3$	✓ $m = -1$ ✓ correct subst. of point $(-2\ ;\ -1)$ ✓ answer **OR** ✓ $m = -1$ ✓ correct subst. of point $(-2;-1)$ ✓ answer (3)
		[12]

QUESTION 5

5.1	$p(x) = \log_a x$ $x = \log_a y$ $\therefore p^{-1}: \quad y = 3^x$	✓ ✓answers (2)
5.2		✓ ✓ shape p ✓ point on p ✓ ✓ shape p^{-1} ✓ point on p^{-1} (6)
5.3	$2 = \log_a x$ $x = 9$ $0 < x \leq 9$	✓ value of x ✓ ✓ answer (3)
5.4	x-intercept of p is (1 ; 0) x-intercept of h is (–1 ; 0)	✓ ✓ answer (2)
		[13]

QUESTION 6

6.1	$y = a(x-p)^2 + q$ $5 = a(0-2)^2 + 3$ $5 = 4a + 3$ $2 = 4a$ $\therefore a = \frac{1}{2}$ $y = \frac{1}{2}(x-2)^2 + 3$ $y = \frac{1}{2}(x^2 - 4x + 4) + 3$ $y = \frac{1}{2}x^2 - 2x + 2 + 3$ $y = \frac{1}{2}x^2 - 2x + 5$	✓ ✓ sub. point A and B correctly ✓ value of a ✓ sub. a, p and q ✓ simplification (5)
6.2	The graph does NOT cut the x-axis. $\therefore$ No real roots $\therefore \Delta < 0$	✓ explanation ✓ $\Delta < 0$ (2)
6.3	$\frac{1}{2}x^2 - 2x + 5 = k$ $\therefore k > 3$	✓ ✓ answer (2)
6.4	$y = \frac{1}{2}x^2 - 2x + 5 - 5$ $y = \frac{1}{2}x^2 - 2x$	✓ answer (1)
		[10]

QUESTION 7

7.1	$1+i_{eff}=\left(1+\frac{0,11}{2}\right)^2$ $i_{eff}=\left(1+\frac{0,11}{2}\right)^2-1$ $i_{eff}=11,30\%$ $\therefore$ Mary has secured the better rate.	✓ correct sub. into correct formula ✓ answer ✓ conclusion (3)
7.2.1	$Fv=\dfrac{10\ 000\left[\left(1+\frac{0,0772}{12}\right)^{114}-1\right]}{\frac{0,0772}{12}}$ $=R1\ 674\ 501,44$	✓ value of i ✓ value of n ✓ correct sub. into correct formula ✓ answer (4)
7.2.2	$R1\ 674\ 501,44=\dfrac{30000\left[1-\left(1+\frac{0,1}{12}\right)^{-n}\right]}{\frac{0,1}{12}}$ $0,46513...=\left[1-\left(1+\frac{0,1}{12}\right)^{-n}\right]$ $0,53486...=\left(1+\frac{0,1}{12}\right)^{-n}$ $\log_{\left(1+\frac{0,1}{12}\right)}0,53486...=-n$ $n=75,4$ She will be able to receive the money in 75 full months.	✓ subst. of P, x and i into correct formula ✓ simplification ✓ correct use of logs ✓ answer (4)
7.2.3	$Pv=\dfrac{30\ 000\left[1-\left(1+\frac{0,1}{12}\right)^{-55}\right]}{\frac{0,1}{12}}$ $Pv=$ R 1 319 260,60 $\therefore$ No	✓ subst. x and i into correct formula ✓ correct value of n ✓ answer ✓ conclusion (4)
		[15]

QUESTION 8

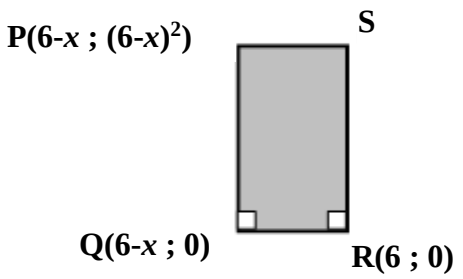
8.1	$f(x) = -2x^2 + 6x$ $f(x+h) = -2(x+h)^2 + 6(x+h)$ $f(x+h) = -2(x^2 + 2xh + h^2) + 6x + 6h$ $f(x+h) = -2x^2 - 4xh - 2h^2 + 6x + 6h$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \to 0} \frac{-2x^2 - 4xh - 2h^2 + 6x + 6h - (-2x^2 + 6x)}{h}$ $f'(x) = \lim_{h \to 0} \frac{-2x^2 - 4xh - 2h^2 + 6x + 6h + 2x^2 - 6x}{h}$ $f'(x) = \lim_{h \to 0} \frac{-4xh - 2h^2 + 6h}{h}$ $f'(x) = \lim_{h \to 0} \frac{h(-4x - 2h + 6)}{h}$ $f'(x) = \lim_{h \to 0} \quad -4x - 2h + 6$ $f'(x) = \quad -4x + 6$	✓ value of $f(x+h)$ ✓ correct sub. into correct formula ✓ factorise ✓ answer (4)
8.2.1	$f(x) = 2x^2 + \frac{1}{2}x^4 - 3$ $f'(x) = 4x + 2x^3$	✓ $4x$ ✓ $2x^3$ (2)
8.2.2	$f(x) = \frac{x^3 - 5x^2 + 4x}{x - 4}$ $f(x) = \frac{x(x^2 - 5x + 4)}{x - 4}$ $f(x) = \frac{x(x-4)(x-1)}{x-4}$ $f(x) = x^2 - x$ $f'(x) = 2x - 1$	✓ factorising ✓ factors ✓ simplification of f ✓ answer (4)

8.3	$y = 2x^2 - 3x - 5$ $\frac{dy}{dx} = 4x - 3$ gradient at $x = 2$ $y = 2x^2 - 3x - 5$ $m = 4(2) - 3$ $m = 5$ $y = 5x - 5$	✓ derivative ✓ substitution ✓ value of m ✓ answer (4)
		[14]

QUESTION 9

9.1	For $y=\frac{4}{x}$ the gradient of the tangent to the curve is -1. $y=4x^{-1}$ $\frac{dy}{dx}=-4x^{-2}=\frac{-4}{x^2}$ $\frac{-4}{x^2}=-1$ $4=x^2$ $\therefore x=-2$ **OR** $x=2$ $\therefore y=-2$ $\quad y=2$ $(-2;-2)$ $\quad (2;2)$	✓ exponential form ✓ derivative ✓ derivative = –1 ✓ x-values ✓ y-values (5)
9.2.1	$y=(x-1)(x-4)^2$ $y=(x-1)(x^2-8x+16)$ $y=x^3-9x^2+24x-16$	✓ $(x-1)(x-4)^2$ ✓ squaring binomial (2)
9.2.2	$y=x^3-9x^2+24x-16$ $\frac{dy}{dx}=3x^2-18x+24=0$ $x^2-6x+8=0$ $(x-2)(x-4)=0$ $x=2$ **OR** $x=4$ $y=4$ **OR** $y=0$ **B(2 ; 4)**	✓ derivative = 0 ✓ factors ✓ y-values ✓ coordinates of B (4)
9.2. 3	$k<-16$	✓ ✓answer (2)
9.2.4	$f''(x)=6x-18$ $6x-18>0$ $x>3$	✓ $6x-18$ ✓ answer (2)
		[15]

QUESTION 10

10.1	$P[6-x\ ;\ (6-x)^2]$	✓ answer (1)
10.2	 $A = L \times B$ $A = x[(6-x)^2]$ $A = x(36-12x+x^2)$ $A = x^3 - 12x^2 + 36x$ $\frac{dA}{dx} = 3x^2 - 24x + 36$ $x^2 - 8x + 12 = 0$ $(x-6)(x-2)$ $x \neq 6$ **OR** $x = 2$ $y = 16$ $A_{max} = 16 \times 2$ $= 32$	✓ correct substitution into area formula ✓ formula for area in terms of x ✓ derivative = 0 ✓ choice of x-value to determine y-value ✓ answer (5)
		[6]

QUESTION 11

11.1	$(x+0,2)\times 0,5=0,2$ $x+0,2=0,4$ $x=0,2$ $0,2+0,2+0,3+y=1$ $y=0,3$	✓P(A) x P(B) = P(A and B) ✓ x- value ✓ sum of probabilities = 1 ✓ y-value (4)
11.2	P(X and Y together) $=\frac{2!5!}{6!}$ $=\frac{1}{3}$ P(X and Y not together) = $1-\frac{1}{3}$ $=\frac{2}{3}$	✓ $\frac{2!5!}{6!}$ ✓ $\frac{1}{3}$ ✓ answer (3)
11.3.1	4 digit numbers (with repetition) $=9\times 10\times 10\times 10$ = 9 000	✓ product ✓ answer (2)
11.3.2	4 digit numbers (without repetition) $=9\times 9\times 8\times 7$ = 4 536	✓ 9 x 9 ✓ 8 x 7 ✓ answer (3)
11.3.3	4 digit numbers (with repetition and last digit = 0) $=9\times 8\times 7\times 1$ = 4 536	✓ product ✓ answer (2)
		[14]

TOTAL: 150