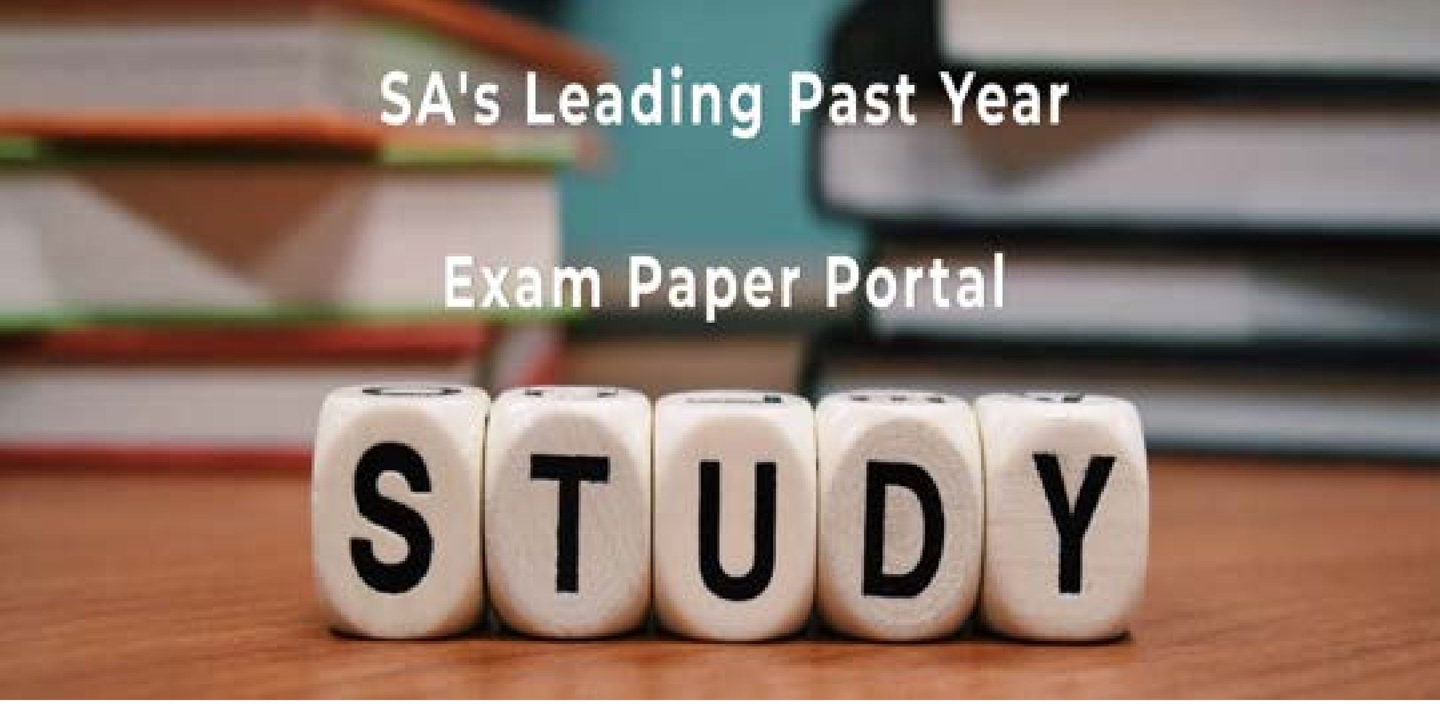


You have Downloaded, yet Another Great Resource to assist you with your Studies ☺

Thank You for Supporting SA Exam Papers

Your Leading Past Year Exam Paper Resource Portal

Visit us @ www.saexampapers.co.za

SA EXAM PAPERS

GAUTENG DEPARTMENT OF EDUCATION

JOHANNESBURG NORTH DISTRICT

2022
GRADE 12
CONTROL TEST

MATHEMATICS
TERM1

MARKING GUIDELINES

MARKS : 100
TIME : 2 hours

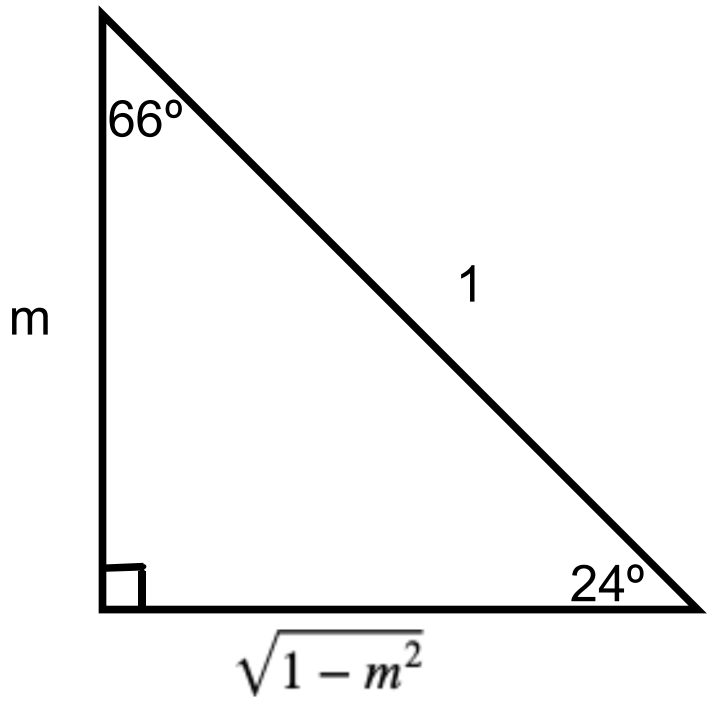
QUESTION 1		
1.1.1	$x^2 - 7x + 10 = 0$ $(x-5)(x-2) = 0$ $x = 5$ or $x = 2$	✓ Factors ✓ Ans (2)
1.1.2	$3x^2 + 2x + 6 = 10$ $3x^2 + 2x - 4 = 0$ $x = \frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-4)}}{2(3)}$ $x = 0{,}87$ or $x = -1{,}54$ **NOTE: penalise 1 mark for incorrect rounding off**	✓ Standard Form ✓ Correct Sub into formula ✓ $x = 0{,}87$ ✓ $x = -1{,}54$ (4)
1.1.3	$x^{\frac{1}{2}} + 3x^{\frac{1}{4}} - 28 = 0$ $(x^{\frac{1}{4}} - 4)(x^{\frac{1}{4}} + 7) = 0$ $x^{\frac{1}{4}} = 4$ or. $x^{\frac{1}{4}} = -7$ $x = 256$ or $x = 2401$ OR $x^{\frac{1}{2}} + 3x^{\frac{1}{4}} - 28 = 0$ Let $k^2 = x^{\frac{1}{2}}$ or $k = x^{\frac{1}{4}}$ $\therefore k^2 + 3k - 28 = 0$ $(k-4)(k+7) = 0$ $k = 4$ or. $k = -7$ $x^{\frac{1}{4}} = 4$ or. $x^{\frac{1}{4}} = -7$ $x^{\frac{1}{4} \times 4} = (4)^4$ or. $x^{\frac{1}{4} \times 4} = (-7)^4$ $x = 256$ or $x = 2401$	✓ Factors ✓ $x^{\frac{1}{4}} = \ldots$ ✓ raising both side to reciprocal ✓ x- values (4) OR ✓ Factors ✓ $x^{\frac{1}{4}} = \ldots$ ✓ multiplying by the reciprocal ✓ x- values (4)

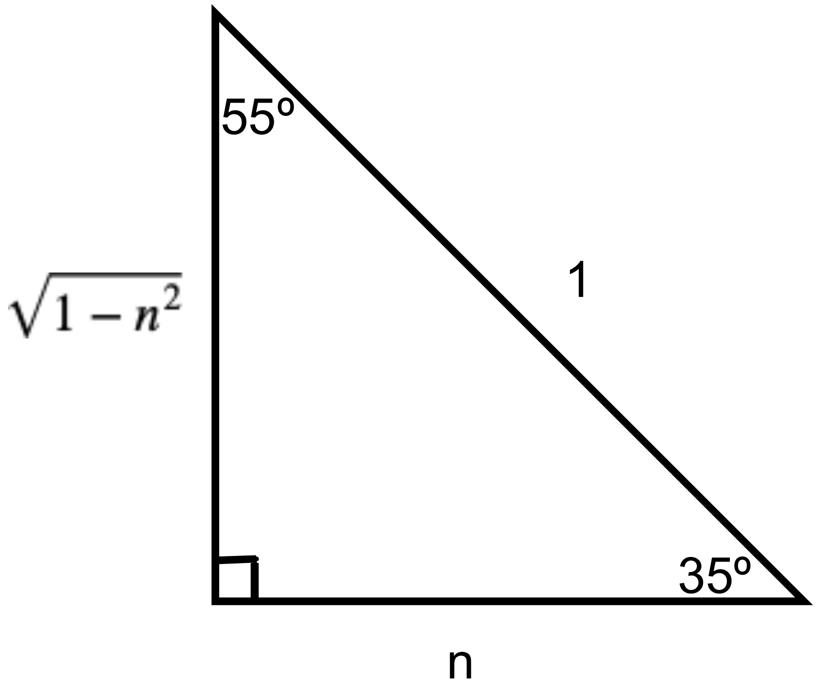
1.1.4	$\sqrt{2-x} = x-2$ $(\sqrt{2-x})^2 = (x-2)^2$ $0 = x^2 - 3x + 2$ $0 = (x-2)(x-1)$ $x = 2$ or $x = 1$ $\therefore x \neq 1$	✓ Squaring ✓ Standard form ✓ Factors ✓ x- values ✓ Selection/ Testing (5)
1.2	$3x^2 + kx - 3x - k = 0.$ $3x^2 + x(k-3) - k = 0$ $\triangle \geq 0$ $b^2 - 4ac \geq 0$ $(k-3)^2 - 4(3)(-k) \geq 0$ $k^2 + 6k + 9 \geq 0$ $(k+3)^2 \geq 0$ $\therefore k \geq -3$	✓ $\triangle \geq 0$ ✓ Subbing correctly ✓ Factors ✓ Ans (4)

1.3	$3y + x = 5$ ……………………..(1) $x^2 + y^2 = 100 + 5y$ …………..(2) $x = 5 - 3y$………………(3) Sub (3) into (2) $(5 - 3y)^2 + y^2 = 100 + 5y$ $2y^2 - 7y - 15 = 0$ $(y - 5)(2y + 3) = 0$ $y = 5$ or. \`$y = \frac{-3}{2}$ $x = -10$ or. $x = \frac{19}{2}$	✓ Equation (3) ✓ Subbing correctly ✓ Standard form ✓ Factors ✓ Y-values ✓ X-values (6)
25 MARKS		

QUESTION 2		
2.1.1	$a + b + c = 1$……..(1) $3a + b = 3$ ………..(2) $2a = 4$ $\therefore a = 2$ $\therefore b = -3$ $\therefore c = 2$ $T_n = 2n^2 - 3n + 2$	✓ Value of a ✓ Value of b ✓ Value of c ✓ General Term (4)
2.1.2	$407 = 2n^2 - 3n + 2$ $0 = 2n^2 - 3n - 405$ $0 = (n - 15)(2n + 27)$ $\therefore n = 15$ or. $n \neq -\frac{27}{2}$	✓ Equating ✓ Standard Form ✓ Both values of *n* ✓ Rejection (4)
2.2	$d = 6$ $202 = 40 + 6(n - 1)$ $\therefore n = 28$	✓ $d = 6$ ✓ Sub ✓ Ans (3)
11 MARKS		

QUESTION 3		
3.1	$-3-3d=a$ …………(1) $-35-19d=a$………(2) (1) = (2) $-3-3d=-35-19d$ $\therefore d=-2$ Sub d-value into (1) $a=-3-(-2)$ $\therefore a=3$	✓ $a=-3-3d$ ✓ $a=-35-19d$ ✓ Equating ✓ $d=-2$ ✓ $a=3$ (5)
3.2	$a=\frac{1}{3}$ $r=3$ $S_{20}=\frac{\frac{1}{3}(3^{20}-1)}{3-1}$ $S_{20}=581130733{,}3$	✓ $a=\frac{1}{3}$ ✓ $r=3$ ✓ Sub ✓ Ans (4)
3.3.1	$\frac{3}{(x-1)^2}+\frac{1}{(x-1)}+\frac{1}{3}+\frac{(x-1)}{9}+\dots$ $r=\frac{x-2}{3}$ $-1<r<1$ $-1<\frac{x-2}{3}y<1$ $-1<y<5$	✓ $-1<r<1$ ✓ Sub ✓ Ans (3)
3.3.2	$S_\infty=\frac{3}{1-\frac{1}{3}}$ $S_\infty=\frac{9}{2}$	✓ Sub ✓ Ans (2)
14 MARKS		

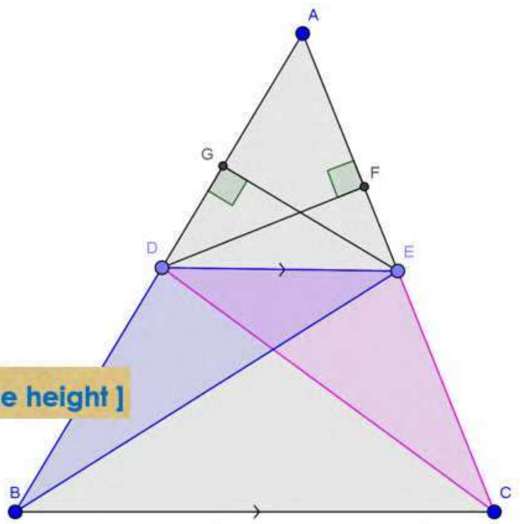
QUESTION 4		
4.1.1	 **Award Full marks for answer only** $\tan 66^\circ = \frac{\sqrt{1-m^2}}{m}$	✓ Sketch ✓ $\sqrt{1-m^2}$ ✓ Ans (3)

4.1.2	 $sin70° = sin(2\times 35°)$ $= 2sin35°.cos35°$ $= 2(\sqrt{1-n^2})(n)$ or $2n\sqrt{1-n^2}$	✓ Sketch ✓ Double angle identity ✓ Ans (3)
4.2	$sin(45°+x).sin(45°-x) = \frac{cos2x}{2}$ LHS $= sin(45°+x).sin(45°-x)$ $= (sin45°.cosx + cos°.sinx)(sin45°.cosx - cos°.sinx)$ $= sin^2 45°.cos^2 x - cos^2 45° sin^2 x$ $= (\frac{1}{\sqrt{2}})^2 cos^2 x - (\frac{1}{\sqrt{2}})^2 sin^2 x$ $= \frac{1}{2}(cos^2 x - sin^2 x)$ $= \frac{1}{2}cos2x$ $\therefore LHS = RHS$	✓ Compound angle expansion ✓ Simplification ✓ Special angles ✓ Double angle identity ✓ $\frac{1}{2}cos2x$ (5)

4.3	$\cos(x+42°) = \sin 2x$ $\cos(x+42°) = \cos(90° - 2x)$ $x + 42° = 90° - 2x + k.360°$ $\therefore 3x = 90° - 42° + k.360°$ $OR\ x + 42° = -(90° - 2x) + k.360°$ $\therefore\ x + 42° = -90° + 2x + k.360°$ $\therefore 3x = 48° + k.360°$ OR $-x = -132° + k.360°$ $x = 16° + k.120°$ OR $x = 132° - k.360°$ $x \in \{-104; 16; 132; 136\}$	✓ cos(90-2x) ✓ ✓ Both gen solution ✓ simplify x= ✓ ✓ Two correct x-values (6)
17 MARKS		

QUESTION 5		
5.1	In ΔPRS : $R\hat{P}S = 180° - (x+y)$ sum ∠'s Δ $\frac{RP}{\sin y} = \frac{z}{\sin[180° - (x+y)]}$ $RP = \frac{z \sin y}{\sin(x+y)}$ In ΔPRQ : $\frac{PQ}{PR} = \sin w$ $PQ = PR \sin w$ $\therefore\ PQ = \frac{z \sin y .\ \sin w}{\sin(x+y)}$	✓ $R\hat{P}S$ ✓ Sine rule ✓ Reduction ✓ Ans (4)
5.2	$PQ = \frac{1000 \sin x .\ \sin(90° - x)}{\sin(x+x)}$ $= \frac{1000 \sin x . \cos x}{2 \sin x . \cos x}$ $= 500\text{m}$	✓ Substitution ✓ Co-ratio ✓ Double angle ✓ Ans (4)
8 MARKS		

QUESTION 6



RTP: $\frac{AD}{DB} = \frac{AE}{EC}$

Construct: an altitude DF & GE in ΔADE and join DC & BE ✓

1. $\frac{Area\Delta ADE}{Area\Delta DEB} = \frac{\frac{1}{2} \times AD \times GE}{\frac{1}{2} \times DB \times GE}$ ✓ S/R [Δ's share same height]

$= \frac{AD}{DB}$ ✓ S/R

2. $\frac{Area\Delta DEA}{Area\Delta DEC} = \frac{\frac{1}{2} \times AE \times DF}{\frac{1}{2} \times EC \times DF}$ [Δ's share same height]

$= \frac{AE}{EC}$ ✓ S/R

3. BUT $Area\Delta DBE = Area\Delta DEC$ [Δ's lie between parallel lines]

✓ S

$\therefore \frac{Area\Delta ADE}{Area\Delta DBE} = \frac{Area\Delta DEA}{Area\Delta DEC} = \frac{AD}{DB} = \frac{AE}{EC}$

5 MARKS

QUESTION 7		
7.1	$\hat{B}_3 = x$ (BC=CD; tans from the same point) $\hat{H}_1 = \hat{B}_3 = x$ (tan chord th) **or** $\hat{H}_1 = \hat{D}_1 = x$ (tan chord th) $\hat{D}_2 = \hat{H}_1 = x$ (∠'s opp equal sides) $\hat{H}_2 = \hat{D}_4 = x$ (tan chord th)	✓ $\hat{B}_3$ & reason ✓ $\hat{H}_1$ & reason ✓ $\hat{D}_2$ & reason ✓ $\hat{H}_2$ & reason (4)
7.2	$\hat{H}_2 = \hat{D}_2 = x$ (proved above) $\therefore HG//BD$ (alt ∠'s =)	✓ S ✓ R (2)
7.3	$\hat{B}_2 = 180° - 2x$ (sum of ∠s in Δ) $\hat{G}_2 = \hat{B}_2 = 180° - 2x$ (ext ∠ of cyclic quad) **Alternative solution** $\hat{D}_1 + \hat{D}_2 = 2x$ $\hat{G}_1 = 2x$ (tan chord th) $\hat{G}_1 = 180° - 2x$ (∠s on a str line)	✓ $\hat{B}_2$ & reason ✓ $\hat{G}_2$ & reason OR ✓ $\hat{G}_2$ & reason ✓ $\hat{G}_1$ & reason (2)
8 MARKS		

QUESTION 8		
8.1	$\hat{A} = \hat{E}_2$ (ext ∠ of cyclic quad) $\widehat{D} = 180° - \hat{E}_2$ (co-int ∠'s BE//CD) $\therefore \widehat{D} + \hat{A} = 180°$ $\therefore ACDF$ is a cyclic quad (opp ∠'s quad sup) **Alternative solution** $\widehat{D} = \hat{E}_1$ (corres ∠s BE//CD) $\hat{E}_2 = 180° - \hat{E}_1$ (∠s on a str line) $\hat{A} = 180 - \hat{E}_1$ (opp ∠ of cyclic quad $ABEF$) $\therefore \widehat{D} + \hat{A} = 180°$ $\therefore ACDF$ is a cyclic quad (opp ∠'s quad sup)	✓ $\hat{A} \equiv \hat{E}_2$ ✓ $\widehat{D}$ & reason ✓ $\widehat{D}$ +A ✓ conclude OR ✓ $\widehat{D} = \hat{E}_1$ ✓ $\hat{A}$ & reason ✓ $\widehat{D}$ +A ✓ conclude (4)
8.2.1	$\hat{B} = \hat{B}$ (common ∠) $\hat{D} = 90°$ (∠ in semi circle) $\hat{P}_2 = 90°$ (adj ∠'s on str line) $\therefore \hat{A} = \hat{E}$ (3^{rd}∠) $\triangle BPE /// \triangle BDA$ (∠ ∠ ∠)	✓ S/R ✓ S/R ✓ S/R ✓ S/R (4)

8.2.2	$\frac{BP}{BD} = \frac{PE}{DA} = \frac{BE}{BA}$ (/// $\triangle$' s) $\frac{BP}{BD} = \frac{PE}{DA}$ $\therefore DA = \frac{BP}{BD \,.\, PE}$ ....(1) $\frac{PE}{DA} = \frac{BE}{BA}$ $\therefore DA = \frac{PE \,.\, BA}{BE}$ ....(2) (2) = (1) $\frac{BP}{BD \,.\, PE} = \frac{PE \,.\, BA}{BE}$ $\therefore BP \,.\, BE = PE^2 \,.\, BA \,.\, BD$ $\therefore BE = \frac{PE^2 \,.\, BA \,.\, BD}{BP}$	✓ S/R ✓ Equation 1 ✓ Equation 2 ✓ $BP \,.\, BE = PE^2 \,.\, BA \,.\, BD$ (4)
12 MARKS		