LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

SEKHUKHUNE SOUTH AND EAST DISTRICT

GRADE 11
MATHEMATICS
TEST 1
10 MARCH 2020

MARKS: 100

DURATION: 2 HOURS

INSTRUCTIONS:

1. This question paper consists of 5 questions, answer all of them.
2. Diagrams are not necessarily drawn to scale.
3. Number your answers exactly as the questions are numbered.
4. Write neatly and legibly.

QUESTION 1

1.1 Solve for x in each of the following:

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

1.1.2 $3x^2-2x=4$ $(correct\ to\ TWO\ decimal\ places)$ (5)

1.1.3 $(x-1)(4-x)\geq 0$ (4)

1.1.4 $\sqrt{x+5}=x-1$ (5)

1.2. Solve for x and y simultaneously if: (6)

$x+4=2y$ and $y^2-xy+21=0$

1.3 Discuss the nature of the roots of the equation $2(x-3)^2+2=0$ (4)

1.4 Determine the value(s) of p if $g(x)=-2x^2-px+3$ has a maximum value of $3\frac{1}{8}$. (4)

[30]

QUESTION 2

2.1 Simplify fully, WITHOUT using a calculator: $\frac{3^{2x+1}.15^{2x-3}}{27^{x-1}.3^{x}.5^{2x-4}}$ (4)

2.2 Solve for x

2.2.1 $(\frac{1}{2})^x=32$ (3)

2.2.2 $2^x-5.2^{x+1}=-144$ (3)

2.2.3 $2-16x^{-\frac{3}{2}}=0$ (3)

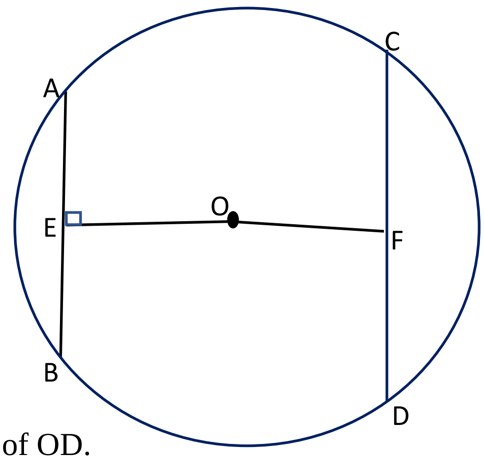
2.2.4 $\sqrt[x]{9}=243$ (3)

[16]

QUESTION 3

3.1 Complete: The line drawn from the centre of the circle perpendicular to the chord …… (1)

3.2 The figure below, AB and CD are chords of the circle with centre O. OE⊥AB. CF=FD. OE=4cm, OF=3cm and CD=8cm.



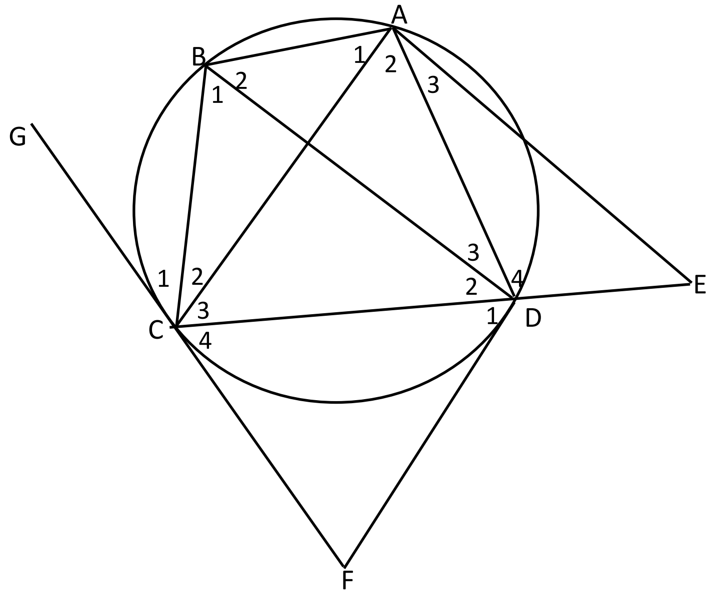
3.2.1 Calculate the length of OD. (3)

3.2.2 Hence calculate the length of AB. (4)

[9]

QUESTION 4

In the diagram below, points A, B, C and D lie on the circumference of a circle. FG and FD are tangents to the circle at C and D respectively. CD is produced to meet AE at E. Furthermore, ∠GCA= 78^0, ∠CBD = 41^0 and ∠BDA = 34^0



4.1.1 Write down, with reasons, THREE other angles that are each equal to 41^0 (6)

4.1.2 Determine with reasons the sizes of the following angles:

(a) $\hat{D}_2$ (3)

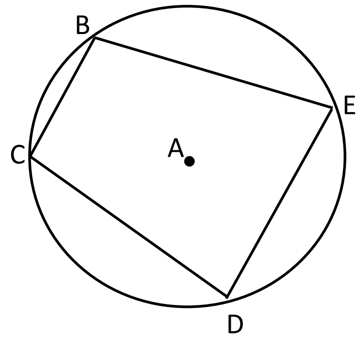
(b) $\hat{B}_2$ (3)

(c) $\hat{D}_4$ (3)

(d) $\hat{F}$ (2)

4.1.3 Determine, with reasons, whether $CADF$ is a cyclic quadrilateral or not (3)

4.2 In the diagram below, A is the centre of the circle and BCDE is a cyclic quadrilateral. Prove the theorem that states that $\angle B + \angle D = 180^0$

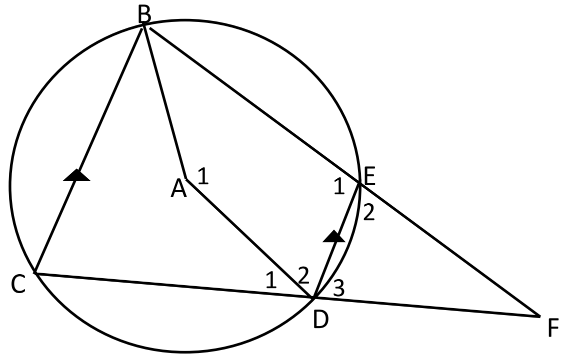


(5)

[25]

QUESTION 5

5.1 In the figure, BCDE is a cyclic quadrilateral. $BC//ED$ in the circle with centre A. BE and CD produced meet at F. $\angle D_3=x$,

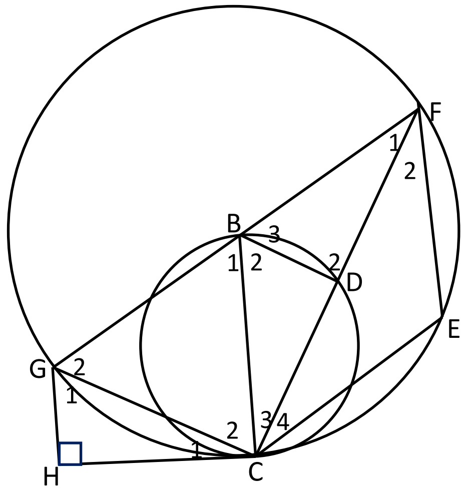


5.1.1 Show that FE=FD (4)

5.1.2 If $\angle D_3=x$, determine the value of ∠F, in terms of x. (2)

5.1.3 Hence, show that BADF is a cyclic quadrilateral (4)

5.2 B is the centre of the larger circle CEFG. BC is the diameter of the smaller circle CDB. HC is a tangent to both circles at C. GH⊥, $\angle C_1=x$.



5.2.1 Prove that CG bisects $\angle BGH$. (5)

5.2.2 Prove that ∠GBD = ∠CEF. (5)

[25]

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GRADE 11

MATHEMATICS
TEST 1
TERM 1
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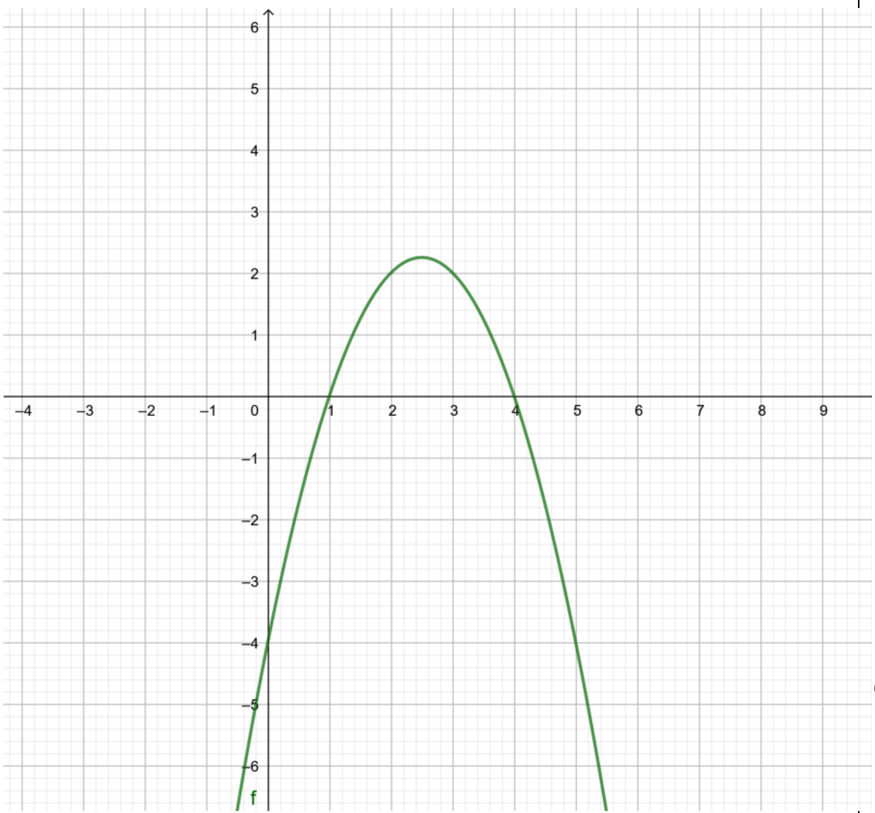
MEMORANDUM

Marks: 100 **Marks: 2 Hour**

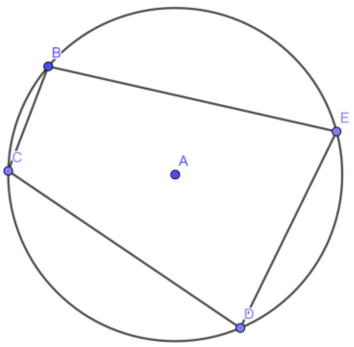
QUESTION 1

1.1	1.1.1 $2x(x-3)$ $2x = 0 \; or \; x - 3 = 0$ $x = 0$✓ $0r \; x = 3$✓	$x = 0$✓ $x = 3$✓ (2)
	1.1.2 $3x^2 - 2x = 4$ $3x^2 - 2x - 4 = 0$ ✓ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-4)}}{2(3)}$ ✓ $x = \frac{2 \pm \sqrt{48}}{6}$✓ $x = 1.49$ ✓ $or = -0{,}82$ ✓	Standard form✓ Substitution✓ simplification✓ answer✓✓ (5)
	1.1.3 $(x-1)(4-x) \geq 0$ 	Critical value✓✓ $1 \leq x \leq 4$✓✓ (4)
	1.1.4 $\sqrt{x+5} = x - 1$ $(\sqrt{x+5})^2 = (x-1)^2$ ✓ $x + 5 = x^2 - 2x + 1$ $x^2 - 3x - 4 = 0$ ✓ $(x-4)(x+1) = 0$ ✓ $\therefore x = 4$✓ $or \; x = -1$ ✓ $x \neq 4$ ✓	Squaring both sides✓ Standard form✓ Factorization✓ both solutions✓✓ rejecting $x = -4$✓ (6)

1.2	$x+4=2y \quad \cdots(1)$ $y^2-xy+21=0 \quad \cdots(2)$ $x=2y-4 \quad \cdots(3)$ ✓ $\therefore y^2-y(2y-4)+21=0$ ✓ $\therefore y^2-2y^2+4y+21=0$ $\therefore -y^2+4y+21=0$ $\therefore y^2-4y-21=0$ ✓ $\therefore (y+3)(y-7)=0$ ✓ $\therefore y=-3 \; or \; y=7$ ✓ $\therefore x=2(-3)-4 \; or \; x=2(7)-4$ $\therefore x=-10 \; or \; x=10$ ✓	$x=2y-4$✓ substitution✓ standard form✓ factors✓ y-values✓ x-values✓ (6)
1.3	$2(x-3)^2+2=0$ $2(x^2-6x+9)+2=0$ $2x^2-12x+20=0$✓ $\Delta=b^2-4ac$ $=(-12)^2-4(2)(20)$✓ $=144-160$ $=-16$ ✓ $\therefore roots \; are \; non \; real/imaginary$ ✓	Standard form✓ substitution✓ -16✓ conclusion✓ (4)
1.4	$g(x)=2x^2-px+3$ $x=\frac{-b}{2a}=\frac{-(-p)}{2(-2)}=\frac{-p}{4}$ ✓ $y=-2\left(\frac{-p}{4}\right)^2-p\left(\frac{-p}{4}\right)+3$✓ $-2\left(\frac{-p}{4}\right)^2-p\left(\frac{-p}{4}\right)+3=3\frac{1}{8}$ $-\frac{p^2}{8}+\frac{2p^2}{8}=\frac{1}{8}$ ✓ $p^2=1$ $p=\pm 1$ ✓ OR Max value=$\frac{4ac-b^2}{4a}$✓ $\frac{4(-2)(3)-p^2}{4(-2)}=\frac{25}{8}$ $\frac{-24-p^2}{-8}=\frac{25}{8}$ $-192-8p^2=-200$✓ $8p^2=8$ $p=\pm 1$✓	$x=\frac{-p}{4}$✓ Substitution✓ Simplification✓ P = ± 1✓ (4)
QUESTION 2		
2.1	$\frac{3^{2x+1}.15^{2x-3}}{27^{x-1}.3^{x}.5^{2x-4}}$ $=\frac{3^{2x+1}.3^{2x-3}.5^{2x-3}}{3^{3x-3}.3^{x}.5^{2x-4}}$ ✓✓	Prime bases✓✓

	$= 3^{2x+1+2x-3-3x+3-x}.5^{2x-3-2x+4}$ ✓ $= 3.5$ $= 15$ ✓	Simplification✓ Answer✓ (4)
2.2	2.2.1 $(\frac{1}{2})^{x} = 32$ $2^{-x} = 2^{5}$ ✓ $-x = 5$ ✓ $\therefore\ x = -5$ ✓	Same base✓ Equating indice✓ answer✓ (3)
	2.2.2 $2^{x} - 5.2^{x+1} = -144$ $2^{x}(1 - 5.2) = -144$ ✓ $2^{x}(-9) = -144$ $2^{x} = 16$ $2^{x} = 2^{4}$ ✓ $x = 4$ ✓	Common factor✓ Same base✓ Answer ✓ (3)
	2.2.3 $2\text{-}16x^{-\frac{3}{2}}=0$ $-16x^{-\frac{3}{2}} = -2$ $x^{-\frac{3}{2}} = \frac{1}{8}$ ✓ $x = 2^{-3\times\frac{-2}{3}}$ ✓ $x = 4$ ✓	Isolating x✓ Raising both sides by $\frac{-2}{3}$✓ answer✓ (3)
	2.2.4 $\sqrt[x]{9} = 243$ $(\sqrt[x]{9})^{x} = (243)^{x}$ $9 = 3^{5x}$ ✓ $3^{2} = 3^{5x}$ $2 = 5x$✓ $x = \frac{2}{5}$ ✓	Exponential form✓ Equating the exponents✓ Answer ✓ (3)
	QUESTION 3	
3.1	Bisects the chord ✓	✓ Answer (1)
3.2	3.2. 1 OF$\perp$ DC (line drawn from centre to the mid-point) $OD^{2} = OF^{2} + FD^{2}$ ✓ $= 3^{2} + 4^{2}$✓ $= 25$ $\therefore$OD = 5✓ 3.2.2 AO = OD = 5✓ (radii) $AE^{2} = AO^{2} - OE^{2}$ (Pythagoras) ✓ $= 5^{2} - 4^{2}$ $= 9$ $\therefore$AE = 3✓ AB = 9 ✓ (line drawn from the centre $\perp$ to the chord)	✓ Pythagoras ✓Method ✓ answer (3) ✓5 ✓Pythagoas ✓ AE = 3 ✓AB = 9 (4)

	QUESTION 4	
4.1.1	$\hat{A}_2 = \hat{B}_1 = 41^0$ ✓ (< in the same segment) ✓ $\hat{C}_4 = \hat{B}_1 = 41^0$ ✓ (tan-chord theorem) ✓ $\hat{D}_1 = \hat{C}_4 = 41^0$ ✓ ($< s$ opp = sides) ✓ OR $\hat{D}_1 = \hat{A}_2 = 41$ (tan-chord theorem)	S ✓and R✓ S✓ and R✓ S✓ and R✓ (6)
4.1.2	(a) $\hat{D}_2 + 34^0 = 78^0$✓ (tan-chord theorem) $\therefore \hat{D}_2 = 44^0$✓ (b) $41° + \hat{B}_2 + 44° + 34° = 180°$✓ (opp $< s$ of a cyclic quad) $\therefore \hat{B}_2 = 61°$✓ $(c) \hat{D}_4 = 41^0 + 61^0$ ✓ ✓ (ext. $< s$ of a cyclic quard) $\therefore \hat{D}_4 = 102^0$ **OR** $\hat{D}_4 + 44° + 31^0 = 180°$ (int.$<_s$ of aΔ)✓ $\hat{D}_4 = 102^0$✓ (d) $\hat{F} + 41^0 + 41^0 = 180^0$ (int. $< s$ of a Δ) ✓ $\hat{F} = 98^0$✓	✓S and R ✓Answer (2) ✓ S and R ✓Answer (2) ✓S and R ✓Answer (2) ✓S and R ✓Answer ✓S and R ✓Answer (2)
4.1.3	$\hat{A} + \hat{F} = 40° + 98^0$✓ $= 138°$ ✓ ✓ $\neq 180°$ $\hat{A} + \hat{F} \neq 180^0$ $\therefore CADF\ is\ not\ cyclic\ quadrilateral$ (Opp angles not Suppl.✓	✓ statement ✓ 138° ✓ $\neq 180°$ ✓ Conclusion (4)
4.2		

	 PROOF: Construction Join C to A and A to E ✓ $\angle A_1 = 2\angle B$ $\quad (\angle\ at\ centre = 2\angle\ at\ circum)$ ✓ $\hat{A}_2 = 2\hat{D}$ $\quad (\angle\ at\ centre = 2\angle\ at\ circum)$ ✓ But $\hat{A}_1 + \hat{A}_2 = 360$ $\quad \angle\ round\ a\ point)$ ✓ $\therefore\ 2\hat{B} + 2\hat{D} = 360^0$ $\therefore \hat{B} + \hat{D} = 180^0$ ✓	✓ Construction ✓S/R ✓S/R ✓S/R ✓Conclusion (5)
4.3	4.3.1 $\angle E_2 = \angle C$ ext $\angle$ of a cyclic quad. ✓ But $\angle C = \angle D_3$ corresponding angles, CB∥ED✓ $\angle E_2 = \angle D_3$ EF = DF ✓ sides opp. Equal angles 4.3.2 $\angle F = 180° - 2x$ ✓ $\quad sum\ of\ angles\ in\ a\ \Delta$✓ 4.3.3 $\angle C = \angle D = x$ ✓ (Corresp. angles. CB∥ED) ✓ $\angle A_1 = 2\angle C = 2x$ ($\angle$ at centre) ✓ $\angle A_1 + \ = \angle F = 2x + 180° - 2x$ $=180°$ $\therefore$ BACF is a cyclic quad (Opp. angles supplementary) ✓	✓ S/R ✓ S/R ✓ Conclusion (3) ✓✓ S/R (2) ✓✓ S/R ✓ S/R ✓ S/R ✓180° ✓ reason
4.4	4.4.1 $\hat{F}_1 = x$ $\quad$ tan-chord theorem ✓ $\hat{B}_1 = 2x$ $\quad \angle\ at\ centre = 2\angle\ at\ circum$ ✓ $\hat{C}_2 = 90^0 - x$ $\quad Right\ angle$ $\hat{G}_1 = 90^0 - x$ $\quad (\ sum\ of\ int\ \angle`s\ of\ \Delta)$ ✓ $G_2 = 90^0 - x$ $\quad (\angle s.\grave{o}pp = sides)$ ✓	✓S/R ✓S/R ✓S/R ✓S/R

	$\hat{G}_1 = \hat{G}_2$ ✓ CG bisect the B$\hat{G}H$	✓S (5)
	4.4.2 $\hat{CEF} = 90^0 - x$ ✓ $(opp\ \angle\text{`}s\ of\ cyclic\ quard)$✓ $\hat{D}_2 = 90^0$ ✓ (line from centre ⊥ to chord) ✓ $\hat{GBD} = 90^0 + x$ (ext $\angle\ of\ \Delta$) $\therefore \hat{GBD} = \hat{CEF}$	✓S ✓R ✓S✓R ✓SR (5)

TOTAL = 100