WTS TUTORING

2021 WTS 11 TERM ONE CAMP

POST TEST

GRADE 11

MARKS : 100

DURATION : 2 HRS

CELL NO. 082 6727 928

www.wtstutoring.org.com/www.wtstutor.co.za

QUESTION 1

1.1 Solve for x:

1.1.1 $7x^2 - 2x - 3 = 0$ (correct to TWO decimal places) (3)

1.1.2 $(x-2)^2 - 4 = 0$ (3)

1.1.3 $\sqrt{7x+2} + 2x = 0$ (4)

1.1.4 $x^2 - x - 56 < 0$ (3)

1.2 Solve for x and y simultaneously: $2x + y = 1$ and $2x^2 - xy + y^2 = 4$ (6)

[19]

QUESTION 2

2.1 Solve for x without the use of a calculator : $x^{\frac{3}{4}} = 64$ (2)

2.2 Simplify without the use of a calculator :

2.2.1 $\dfrac{5^{-x}.125^{1-x}.25^{2x}}{5}$ (3)

2.2.2 $\sqrt{12} - \sqrt{147} + 3^{1,5}$ (3)

2.3 If $\dfrac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1} = a$, calculate a without the use of a calculator. (3)

[11]

QUESTION 3

ANSWER QUESTION 3 WITHOUT USING A CALCULATOR.

3.1 Given: $\tan\theta = -\dfrac{9}{40}$ and $180° < \theta < 360°$.

Use a sketch to determine the value of $\sin\theta + \cos\theta$. (4)

3.2 Simplify fully:

$$\frac{\sin(90° - \theta).\tan(360° - \theta).\sin(\theta - 180°)}{1 - \cos^2\theta}$$ (6)

3.3 Determine the value of the following in terms of p, if $\cos 32° = p$:

3.3.1 $\cos 212°$ (2)

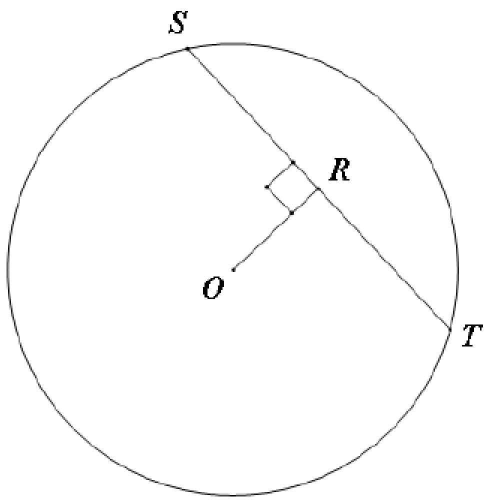
3.3.2 $\sin(-328°)$ (3)

[15]

GIVE REASONS FOR YOUR STATEMENTS AND CALCULATIONS IN QUESTIONS 4 AND 5.

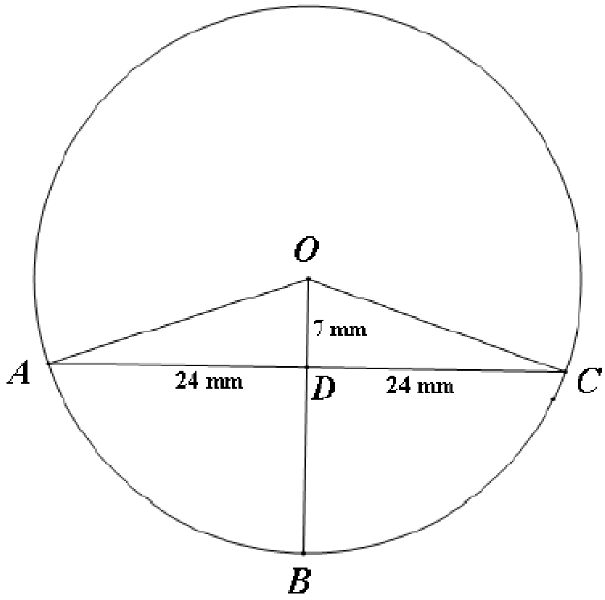
QUESTION 4

4.1 In the diagram, O is the centre of the circle and R is a point on chord ST, such that OR is perpendicular to ST.



Prove the theorem which states that SR = RT. (5)

4.2 In the diagram, O is the centre of the circle and D is a point on chord AC such that AD = DC = 24 mm. OD is drawn and produced to meet the circle at B. OD = 7 mm. OA and OC are drawn.

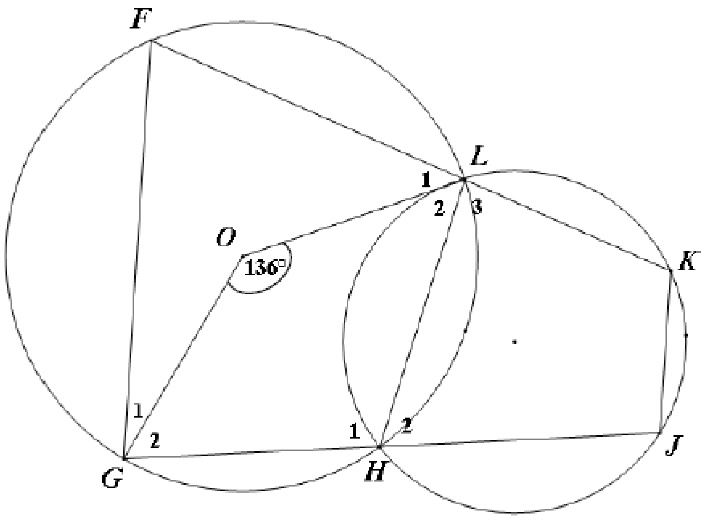


Calculate the length of BD. (5)

[10]

QUESTION 5

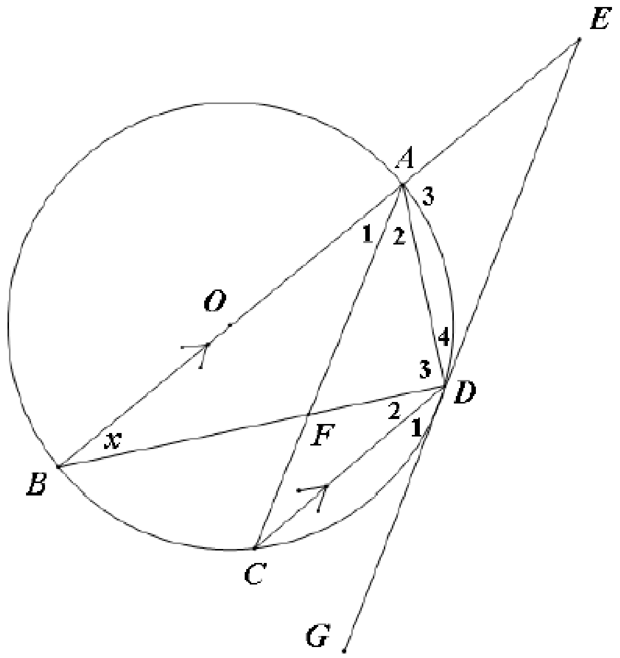
5.1 In the diagram two circles intersect at L and H. O is the centre of the circle passing through F, G, H and L. GO and LO are drawn. LHJK is a cyclic quadrilateral. FLK and GHJ are straight lines. $G\hat{O}L = 136°$



5.1.1 Calculate the size of $\hat{F}$. (2)

5.1.2 Calculate the size of $\hat{K}$. (4)

5.2 In the diagram, O is the centre of the circle. Diameter BOA is produced to E such that EDG is a tangent to the circle at D. C is a point on the circle such that BA || CD. AD, BD and AC are drawn. F is a point of intersection of AC and BD. Let $\hat{B} = x$.



5.2.1	Write down, with reasons, four other angles each equal to x.	(6)
5.2.2	Determine the size of $\hat{E}$ in terms of x.	(4)
5.2.3	Prove that CA is a tangent to the circle passing through A, D and E.	(4)
		[20]

TOTAL: 75

MEMO

QUESTION 1

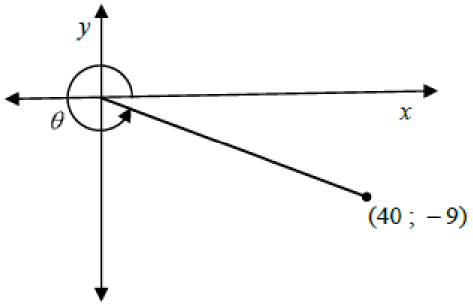
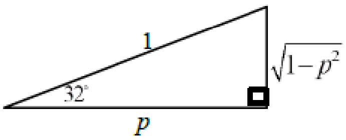
1.1.1	$7x^2-2x-3=0$ $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\dfrac{-(-2)\pm\sqrt{(-2)^2-4(7)(-3)}}{2(7)}$ $x=-0{,}53$ or $x=0{,}81$	✓ substituting in correct formula ✓ x-values ✓ x-values (3)
1.1.2	$(x-2)^2-4=0$ $(x-2)^2=4$ $x-2=\pm 2$ $x=4$ or $x=0$ **OR** $(x-2)^2-4=0$ $x^2-4x+4-4=0$ $x^2-4x=0$ $x(x-4)=0$ $x=4$ or $x=0$	✓ isolate $(x-2)^2$ ✓ ± 2 ✓ both answers **OR** ✓ x^2-4x+4 ✓ factors ✓ both answers (3)
1.1.3	$\sqrt{7x+2}+2x=0$ $(\sqrt{7x+2})^2=(-2x)^2$ $7x+2=4x^2$ $4x^2-7x-2=0$ $(4x+1)(x-2)=0$ $x=-\dfrac{1}{4}$ or $x=2$ $\therefore x=-\frac{1}{4}$ only	✓ isolate $\sqrt{7x+2}$ ✓standard form ✓ factors ✓ correct solution (4)

1.1.4	$x^2 - x - 56 < 0$ $(x-8)(x+7) < 0$ CV $x = 8$ *or* $x = -7$ $+ \quad \vert_{-7} \quad - \quad \vert_{8} \quad +$ $-7 < x < 8$	✓correct factors ✓✓correct solution (3)
1.2	$2x + y = 1$ and $2x^2 - xy + y^2 = 4$ $y = 1 - 2x$ $2x^2 - x(1-2x) + (1-2x)^2 = 4$ $2x^2 - x + 2x^2 + 1 - 4x + 4x^2 = 4$ $8x^2 - 5x - 3 = 0$ $(8x+3)(x-1) = 0$ $x = -\frac{3}{8}$ or $x = 1$ $y = 1 - 2\left(-\frac{3}{8}\right)$ or $y = 1 - 2(1)$ $y = 1\frac{3}{4}$ or $y = -1$ **OR** $2x + y = 1$ and $2x^2 - xy + y^2 = 4$ $x = \frac{1-y}{2}$ $2\left(\frac{1-y}{2}\right)^2 - y\left(\frac{1-y}{2}\right) + y^2 = 4$ $2\left(\frac{1-2y+y^2}{4}\right) - y\left(\frac{1-y}{2}\right) + y^2 - 4 = 0$ $1 - 2y + y^2 - y + y^2 + 2y^2 - 8 = 0$ $4y^2 - 3y - 7 = 0$ $(4y-7)(y+1) = 0$ $y = 1\frac{3}{4}$ or $y = -1$ $x = \frac{1 - 1\frac{3}{4}}{2}$ or $x = \frac{1-(-1)}{2}$ $x = -\frac{3}{8}$ or $x = 1$	$y = 1 - 2x$ ✓substitution ✓ standard form ✓ factors ✓ x values ✓y values (6) **OR** $x = \frac{1-y}{2}$ ✓substitution ✓ standard form ✓ factors ✓ y values ✓x values (6)
		[19]

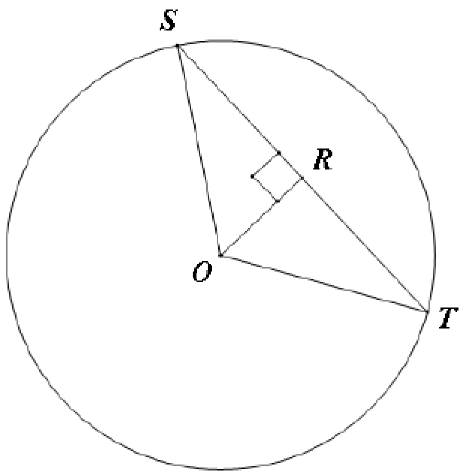
QUESTION 2

2.1	$x^{\frac{3}{4}} = 64$ $\left(x^{\frac{3}{4}}\right)^{\frac{4}{3}} = (2^6)^{\frac{4}{3}}$ $x = 256$ or 2^8	✓ raising both sides to the $\frac{4}{3}$ ✓ answer (2)
2.2.1	$\frac{5^{-x}.125^{1-x}.25^{2x}}{5}$ $= \frac{5^{-x}.(5^3)^{1-x}.(5^2)^{2x}}{5}$ $= \frac{5^{-x}.5^{3-3x}.5^{4x}}{5}$ $= 5^{-x+3-3x+4x-1}$ $= 5^2$ $=25$	✓rewriting as base 3 ✓using exponential rules ✓ answer (3)
2.2.2	$\sqrt{12} - \sqrt{147} + 3^{1,5}$ $= \sqrt{4 \times 3} - \sqrt{49 \times 3} + 3^{\frac{3}{2}}$ $= 2\sqrt{3} - 7\sqrt{3} + \sqrt{9 \times 3}$ $= 2\sqrt{3} - 7\sqrt{3} + 3\sqrt{3}$ $= -2\sqrt{3}$	✓ simplifying surds ✓ $3\sqrt{3}$ ✓ answer (3)
2.3	$\frac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1} = a$ $\frac{5^{2004}(5^2 - 1) + 24}{5^{2004} + 1} = a$ $\frac{5^{2004}(24) + 24}{5^{2004} + 1} = a$ $\frac{24(5^{2004} + 1)}{5^{2004} + 1} = a$ $a = 24$	✓factorising ✓factorising ✓answer (3)
		[11]

QUESTION 3

3.1	 $x^2 + y^2 = r^2$ $40^2 + (-9)^2 = r^2$ $r = 41$ $\sin\theta + \cos\theta$ $= \frac{-9}{41} + \frac{40}{41}$ $= \frac{31}{41}$	✓ correct sketch in 4^{th} quadrant ✓ value of r ✓ substitution ✓ answer (4)
3.2	$\frac{\sin(90^\circ - \theta)\tan(360^\circ - \theta)\sin(\theta - 180^\circ)}{1-\cos^2\theta}$ $= \frac{\cos\theta . -\tan\theta . -\sin\theta}{\sin^2\theta}$ $= \frac{\cos\theta . -\frac{\sin\theta}{\cos\theta} . -\sin\theta}{\sin^2\theta}$ $= 1$	$\cos\theta$ $-\tan\theta$ $-\sin\theta$ $\sin^2\theta$ $\frac{\sin\theta}{\cos\theta}$ ✓ answer (6)
3.3.1	$\cos 212°$ $= \cos(180° + 32°)$ $= -\cos 32°$ $= -p$	$-\cos 32°$ ✓ answer (2)
3.3.2	$\sin(-328°)$ $= \sin 32°$ $= \sqrt{1-\cos^2 32°}$ $= \sqrt{1-p^2}$ 	$\sin 32°$ ✓ correct sketch or identity ✓ answer (3)
		[15]

QUESTION 4

4.1	 Construction: Draw OS and OT. Proof: In ΔOSR and ΔOTR: 1. OS = OT [radii] 2. OR = OR [common] 3. $S\hat{R}O = T\hat{R}O = 90°$ [$\angle s$ on a straight line] $\therefore \Delta OSR \equiv \Delta OTR$ [90°; H; S] $\therefore$ SR = RT [$\equiv \Delta s$]	✓ construction ✓ S/R ✓ S (OR is common) ✓ S/R ✓ S/R (5)
4.2	$OD \perp AC$ [line from centre to midpoint of chord] $OA^2 = AD^2 + OD^2$ [Pythagoras] $= 24^2 + 7^2$ $= 625$ OA = 25 mm OB = OA [radii] $\therefore BD = 25 - 7 = 18\text{ mm}$	✓ S/R ✓ S/R ✓ length of the radius ✓ S/R ✓ answer (5)
		[10]

QUESTION 5

5.1.1	$\hat{F}=\frac{1}{2}G\hat{O}L$ [$\angle$ at centre $=2\times\angle$ at circumference] $=68°$	✓ R ✓ answer (2)
5.1.2	$\hat{F}+\hat{H}_1=180°$ [opp. $\angle$s of cyclic quadrilateral] $\hat{H}_1=180°-68°$ $=112°$ $\hat{K}=\hat{H}_1$ [ext. $\angle$ of cyclic quadrilateral] $=112°$ **OR** $\hat{H}_2=\hat{F}=68°$ [ext. $\angle$ of cyclic quadrilateral] $\hat{K}=112°$ [opp. $\angle$s of cyclic quadrilateral]	✓ R ✓ size of $\hat{H}_1$ ✓ R ✓ answer (4) **OR** ✓ S ✓ R ✓ S ✓ R (4)
5.2.1	$\hat{C}=x$ [$\angle$s in the same segment] $\hat{A}_1=\hat{C}=x$ [alt. $\angle$s; BA ‖ CD] $\hat{D}_2=\hat{A}_1=x$ [$\angle$s in the same segment] $\hat{D}_4=\hat{B}=x$ [tan-chord theorem] **OR** $\hat{D}_2=x$ [alt. $\angle$s; BA ‖ CD] $\hat{A}_1=\hat{D}_2=x$ [$\angle$s in the same segment] $\hat{C}=\hat{B}=x$ [$\angle$s in the same segment] $\hat{D}_4=\hat{B}=x$ [tan-chord theorem]	✓ S ✓ R ✓ S/R ✓ S/R ✓ S ✓ R (6) **OR** ✓ S/R ✓ S ✓ R ✓ S/R ✓ S ✓ R (6)
5.2.2	$\hat{D}_3=90°$ [$\angle$ in a semicircle] $\hat{E}=180°-(\hat{B}+B\hat{D}E)$ [sum of $\angle$s in Δ] $=180°-(x+90°+x)$ $=90°-2x$ **OR** $\hat{D}_3=90°$ [$\angle$ in a semicircle] $\hat{E}+C\hat{D}E=180°$ [co-interior $\angle$s; BA ‖ CD] $\hat{E}=180°-C\hat{D}E$ $=180°-(x+90°+x)$ $=90°-2x$	✓ S ✓ R ✓ S ✓ answer (4) **OR** ✓ S ✓ R ✓ S ✓ answer (4)

5.2.3	$\hat{A}_2 = 180^\circ - (\hat{B} + \hat{D}_3 + \hat{A}_1)$ [sum of $\angle$s in ΔABD] $= 180^\circ - (x + 90^\circ + x)$ $= 90^\circ - 2x$ $\therefore \hat{A}_2 = \hat{E}$ [both $= 90^\circ - 2x$] $\therefore$ AE is a tangent to the circle through A, D and E [converse: tan-chord-theorem]	✓ S $\hat{A}_2 = 90^\circ - 2x$ $\hat{A}_2 = \hat{E}$ ✓ R (4)
	OR	**OR**
	$\hat{D}_1 = 180^\circ - (\hat{D}_2 + \hat{D}_3 + \hat{D}_4)$ [$\angle$s on a straight line] $= 180^\circ - (x + 90^\circ + x)$ $= 90^\circ - 2x$ $\hat{D}_1 = \hat{A}_2$ [tan-chord-theorem] $\therefore \hat{A}_2 = 90^\circ - x$ $\therefore \hat{A}_2 = \hat{E}$ [both $= 90^\circ - 2x$] $\therefore$ AE is a tangent to the circle through A, D and E [converse: tan-chord-theorem]	✓ S $\hat{A}_2 = 90^\circ - 2x$ $\hat{A}_2 = \hat{E}$ ✓ R (4)
		[20]

TOTAL MARKS: 75