The Islamic Institution For Education & Teaching Al-Mahdi Schools **Hadath**	IN HIS NAME	Mathematics Department **School year:** 2019-2020 **Name:**
Grade: 11Sc. **Section:** A	**W. S-2**	**Subject:** *Trigonometry*

I- Take that: $cos\frac{\pi}{4}=\frac{\sqrt{2}}{2}$.

a. Calculate the exact value of: $cos^2\frac{\pi}{8}$.

b. Deduce the exact values of: $os\frac{\pi}{8}$ & $sin\frac{\pi}{8}$.

II- The parts of this question are independent.

1) x & y are two acute angles such that : $tanx=\frac{1}{2}$ & $tany=\frac{1}{3}$. Calculate $\tan(x+y)$ and deduce the value of $(x+y)$.

2) Show that $\frac{\left(\cos\frac{\pi}{8}+\sin\frac{\pi}{8}\right)^2}{cos^2\frac{\pi}{8}-sin^2\frac{\pi}{8}}=\sqrt{2}+1$

3) Show that : $\frac{\sin 4x}{4\sin x}=\cos x\,.\cos 2x$

4) Calculate, without using the calculator, $\cos\left(\frac{\pi}{12}\right)\sin\left(\frac{5\pi}{12}\right)+\sin\left(\frac{\pi}{12}\right)\cos\left(\frac{5\pi}{12}\right)$.

III- Solve the following equations in $\mathbb{R}$.

a. $\sin\left(x+\frac{\pi}{4}\right)=\cos x$ b. $\left|\tan(2x)\right|=1$

IV- Given that $E=\sin x+2\sin 2x+\sin 3x$ $so\,that, x\in]0,\pi[$

a. Prove that $E=4\sin 2x\cdot\cos\frac{x}{2}$

b. Solve the equation: $E=0$.

V- Given two arcs $\mathbf{a}\in\left[0;\frac{\pi}{4}\right]$ and $\mathbf{b}\in\left[0;\frac{\pi}{2}\right]$ such that $\sin a=\frac{\sqrt{5}}{5}$ and $\cos b=\frac{4}{5}$

<u>Part-A</u>:

1) Verify that $\sin b=\frac{3}{5}$ and $\cos a=\frac{2\sqrt{5}}{5}$

2) Calculate $sin2a$ & $cos2a$.

3) Calculate $cos(2a+b)$ then deduce the value of $(2a+b)$.

<u>Part-B</u>:

1) Prove that: $\frac{1-\cos 2a}{1+\cos 2a}=\tan^2 a$ for all $a\neq\frac{\pi}{2}+k\pi$, then deduce the value of $\tan\frac{\pi}{8}$.

2) Solve the equation: $\sin^2 x+3\cos^2 x+\sin x=2$.

VI- Consider the equation (F): $(\cos a)x^2-(2\sin a)x+\cos a=0$, where a is a real number.

a. Prove that : If (F) admits one double root in R , then $\cos 2a=0$.

b. Let *S* and *P* be the sum and the product of the roots x_1 and x_2 of (F), when they exist.

c. Write $\tan 2a$ in terms of *S* and *P*.

VII- If x is any acute angle then,

a. Show that: $\tan(\frac{\pi}{4}-x)=\frac{\cos x-\sin x}{\cos x+\sin x}$

b. Deduce that: $\frac{\cos 2x}{1+\sin 2x}=\tan(\frac{\pi}{4}-x)$