**Analytic Trigonometry Unit 03 Problems**

**Review**

1) The given angle 182° is in standard position.

III

IV

II

I

 Calculate the quadrant in which the angle lies:

a) I b) II

c) III d) IV

2) Classify the given angle: 36º

a) Acute b) Right c) Obtuse d) Straight

3) For the triangle shown, calculate:

**Hint**

sin(*θ*) = rise or . opposite .

 hypotenuse hypotenuse

cos(*θ*) = run . or . adjacent .

 hypotenuse hypotenuse

tan(*θ*) = rise or opposite

 run adjacent

cot(*θ*) = run or adjacent

 rise opposite

sec(*θ*) = hypotenuse or hypotenuse

 run adjacent

csc(*θ*) = hypotenuse or hypotenuse

 rise opposite

a

b

1

43º

 b =

.7193

.6947

1

*θ*

4) For the triangle shown, calculate:

 cot(*θ* ) =

5) Simplify sin2 161º + cos2 161º

a) 2 b) 1

c) 3 d) 10

**Graphs of Trig Functions**

 6) Identify the trig function in each graph (note: these may not be the STANDARD graphs):



**C**

**B**

**A**



**F**

**E**

**D**

**Radians**

 7) Convert 180º to radians

**Degrees to Radians** multiply degrees by:



**Radians to Degrees** multiply radians by:



a) π /10 b) – π

c) 0 d) π

 8) Convert – 2π to degrees

a) 360º b) –360º

c) –720º d) 720º

 9) Calculate the value of cos π/ 3

 (remember to change your calculator to radians)

a) 1 b) ½ c) –1/2 d) 0

One hertz (Hz) is one cycle (360 º) per second). To convert Hz to radians per second (ω), you multiply Hz by 2π.

10a) In North America the electricity delivered is to our houses at 60 Hz. Convert this to

 radians per second:

10b) In music, middle c is 261.625565 hertz. Convert this to radians per second:

10c) The processor in a computer runs at 2,660,000,000 Hz. Convert this to radians per

 second:

**Arc Length** http://www.mas.ncl.ac.uk/mas0001/static/pdf/trigonometry-radians.pdf

The length of an arc in a circle is just a portion of the circumference, (which we know is 2πr, where r is the radius of the circle).

This give us the equation for arc length of:

*l* = *θ*r

where r is the radius of the circle and *θ* is the angle of the arc, in radians.

11) Calculate the length of the arc of a segment cut out of a circle with a radius of 4 cm and an

 angle of 0.7 radians:

12) An arc AB with center C has a radius of 7 and an angle of 60º

 Convert the angle into radians :

13) An arc AB with center C has a radius of 7 and an angle of 60º

 Calculate the length of the arc:

### **Oscillating Springs**

An object attached to a spring can oscillate

The motion has a "natural frequency" (ω) given by:

{\displaystyle \omega ={\sqrt {\frac {k}{m}}},} ω = $\frac{k}{m}$

*k* is the spring constant (in N/M, Newtons per meter)

*m* is the mass of the object

14) Calculate the natural frequency of a spring with a spring constant of 20 N/m and a mass

 *m* of 250 g (your answer will be in rad/s - don't forget the units!):

Angular frequency is often referred to as "frequency", but they differ by a factor of 2*π*

*f* is the "ordinary" revolutions-per-second frequency rather than the ω angular frequency

*f* = $\frac{ω}{2π}$

15) Calculate the revolutions-per-second frequency of a spring with a spring constant of 20

 N/m and a mass *m* of 250 g (your answer will be in RPS or hertz Hz - don't forget the

 units!):

{\displaystyle a=-4\pi ^{2}f^{2}x.}14){\displaystyle a=-4\pi ^{2}f^{2}x.}

**LC Circuits**

An **LC circuit** is contains both an inductor and a capacitor connected together

Both inductors and capacitors store energy, but an inductor stores the energy in the form of a

magnetic field, whereas a capacitor stores the energy in the form of an electric field

The resonant angular frequency ω in a series LC circuit is calculated:

ω = $\sqrt{\frac{1}{LC}}$

 where *C* is the capacitance measured in F (farads) and

 *L* is the inductance of the circuit measured in H (henrys)

16) Calculate the resonant angular frequency in a series LC circuit with inductance of 0.003 H

 and capacitance of 0.0008 F (your answer will be in rad/s - don't forget the units!):

The resonant frequency (non-angular) can be found by:

*f*  = $\frac{1}{2π}\sqrt{\frac{1}{LC}}$

17) Calculate the resonant frequency (non-angular) in a series LC circuit with inductance of

 0.003 H and capacitance of 0.0008 F (your answer will be in hertz - don't forget the

 units!):

**Circuit Analysis**

An RC circuit contains both a resistor and a capacitor

A capacitor stores energy

A resistor placed in series with it will control the rate at which it charges or discharges

It reacts to sine-shaped voltages

*I* = current in mA (milliamps)

R = resistance in Ω (ohms)

C = capacitance in F (farads)

*f* = the frequency of the voltage in Hz (hertz, where one hertz is one

cycle per second)

ω = frequency in radians per second (rps or rad/sec)

The capacitive reactance XC (in Ω) is calculated by:

XC = $\frac{1}{2πfC }$

18) Calculate the capacitive reactance XC for a circuit with *f* = 1000 Hz

 *I* = 0.2 A

 R = 10,000 Ω

 C = 0.0001 F

 (don’t forget the units, Ω!):

The impedance Z (in Ω) is derived using the Pythagorean theorem:

Z = $\sqrt{R^{2}+X\_{C}^{2}}$

19) Calculate the impedance for the circuit described (don’t forget the units, Ω!):

Ohm's Law is SUPER important in electronics (ask any electronics engineer!)

It shows the relationship between voltage (V in volts), current and resistance

For this problem, Ohm's Law would be:

VS = *I* × Z/1000

20) Calculate the voltage for the circuit we've been using (don’t forget the units, V!):

**Extra Credit**

A slice of pizza has a radius of 9 cm and an angle of 2π/3

Calculate the perimeter of the slice of pizza: