Practice problems 1:

Identify the quadrants for the following angles:

1 $1 rad =$

2 $2 rad =$

3 $3 rad =$

4 $100^0 =$

5 $366^0 =$

6 $\frac{\pi}{3} rad =$

7 $-\frac{\pi}{6} rad =$

8 $(\pi + \frac{\pi}{3}) rad =$

9 $-120^0 =$

10 $(\frac{11\pi}{6}) rad =$

answers: 1. Q1, 2. Q2, 3. Q2, 4. Q2, 5. Q1, 6. Q1, 7. Q4, 8. Q3, 9. Q3, 10. Q4

Convert the following from degrees to radians or radians to degrees:
(hint. if an angle does not show it is in degrees or radians, assume it is in radians!)

1 $90^0 =$

2 $270^0 =$

3 $\pi rad =$

4 $\frac{\pi}{6} rad =$

5 $\frac{7\pi}{6} rad =$

6 $\frac{4\pi}{3} rad =$

7 $-\frac{5\pi}{6} rad =$

8 $4.678 rad =$

9 $139^0 =$

10 $8\pi =$

answers: 1. Π/2, 2. 3Π/2, 3. 180deg, 4. 30deg, 5. 210deg, 6. 240deg
7. -150deg, 8. 268deg, 9. 2.426rad, 10. 1440deg

Determine if the following angles are coterminal:

30º, 750º ?

1180º, 100º ?

48º, 722º?

-Π/3 rad, 5Π/3 rad ?

answers: 1. Y, 2. Y, 3. N, 4. Y

Convert the following angles to the reference angle. Give the quadrant and angle in degrees.

	angle	ref	quad
1.	150^{0}		
2.	317^{0}		
3.	-125^{0}		
4.	68^{0}		
5.	780^{0}		

1. 30, Q2, 2. 43, Q4, 3. 55, Q3, 4. 68, Q1, 5. 60, Q1

Solve the following:

1. You have a wheel that is spinning at 5 rev/min. What is its angular velocity in rad/min?

2. A drill bit is turning at 30 rev/sec. How many rev/hour is it spinning?

3. A jet engine is spinning at 5000 Rev/min. What is the linear velocity in feet/min of a blade on the turbine that is 2 feet from the center?

4. A moon is located 1000 miles from the core of a small planet it is revolving around. It makes three complete revolutions around the planet per week. What is its angular velocity in radians/week and what is its linear velocity in miles per week?

5. A clock spontaneously fell off the wall in a classroom, witnessed by fifty students. It was a completely random event and the teacher had absolutely nothing whatsoever to do with it. The clock fell to the floor and was permananently stopped at 3:30. The repair shop decided not to replace the clock because they argue it will still give the correct time twice a day and that's good enough. The trig teacher decides to take advantage of a bad situation and asks the students to solve this problem. What is the angle in degrees between the big hand and the little hand on that clock at 3:30?

6. A windmill is rotating at a rate of 22 rev/min. If it's blades are 130 feet in length (radius of the fan), what is the linear velocity in yards/hour of a point at the end of the blades?

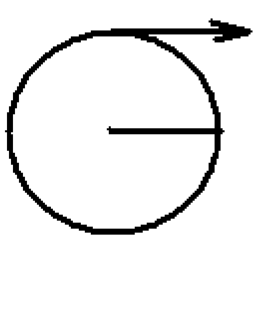
7. A drive train wheel whose radius is 10 feet is rotating at 70 turns per second. Another wheel whose radius is 4 feet is in contact with and is being driven by that wheel. What is the Linear velocity in feet per second of a point on the edge of the smaller wheel and how many rotations per second is it turning?

8. A 26 inch radius bicycle wheel is moving along the ground at 5 feet/sec. What is its angular velocity in rotations/minute?

9. NASA decides to build a rotating space station (big wheel) that has a radius of 500 feet. If the plan is to rotate the station one complete rotation every 2 minutes, What will be the linear velocity in feet per second of a person standing in the rotating section?

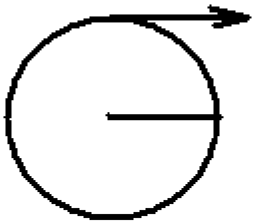
10. A tallest ferris wheel in the world, the 541 foot diameter Singapore Flyer, takes 1/2 hour to make one complete revolution. How many feet per minute are the passengers moving?

Answers: 1.



$$AV = \frac{5\ \text{rev}}{\text{min}} \times \frac{2\pi\ \text{rad}}{\text{rev}} = \frac{10\pi\ \text{rad}}{\text{min}}$$

2.



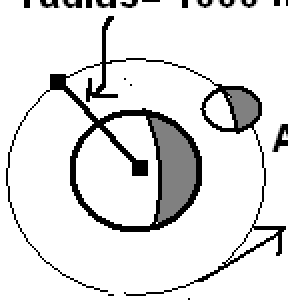
$$\frac{30\,\text{rev}}{\text{sec}} \times \frac{3600\,\text{sec}}{1\,\text{hr}} = \frac{108000\,\text{rev}}{\text{hr}}$$

3.

$$LV = \frac{5000\,\text{rev}}{\text{min}} \times \frac{2\pi\,\text{rad}}{1\,\text{rev}} \times \frac{2\,\text{ft}}{\text{rad}} = \frac{20000\pi\,\text{ft}}{\text{min}}$$

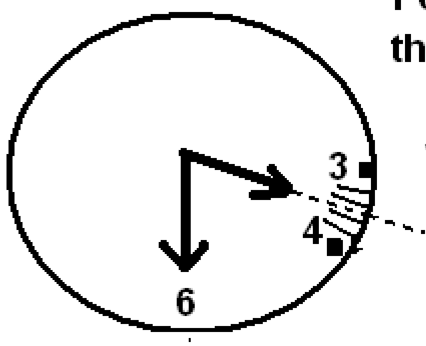
4.

radius= 1000 mi



$$AV = \frac{3\,\text{rev}}{\text{wk}} \times \frac{2\pi\,\text{rad}}{1\,\text{rev}} \times \frac{1000\,\text{mi}}{1\,\text{rad}} = \frac{6000\pi\,\text{mi}}{\text{wk}}$$

5.



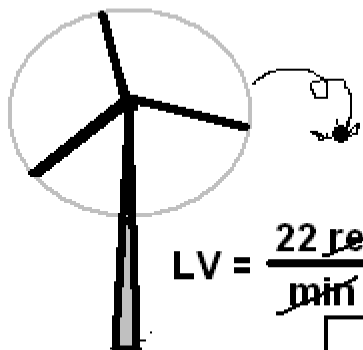
1 clock minute = 6 degrees

there are 30 degrees between numbers

So from 4 to 6 is 60 degrees and half way between 3 and 4 is 15 degrees.

15 deg + 60 deg = 75 deg

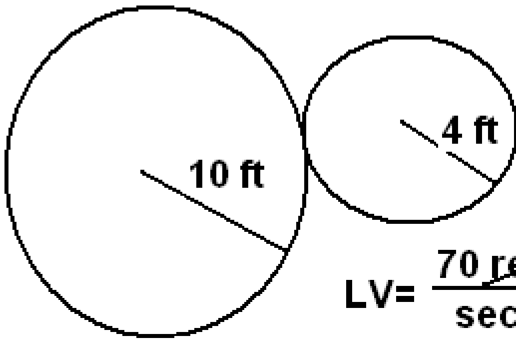
6.



$$LV = \frac{22\ \text{rev}}{\text{min}} \times \frac{2\pi\ \text{rad}}{\text{rev}} \times \frac{130\ \text{ft}}{\text{rad}} \times \frac{1\ \text{yd}}{3\ \text{ft}} \times \frac{60\ \text{min}}{1\ \text{hr}} =$$

$= \frac{114400\pi\ \text{yd}}{\text{hr}}$	or 359398.1996 yd/hr

7.



$$LV = \frac{70\ \cancel{rev}}{sec} \times \frac{2\ \pi\ \cancel{rad}}{\cancel{rev}} \times \frac{10\ ft}{\cancel{rad}} = \frac{1400\ \pi\ ft}{sec}$$

$$AV\ (\text{small wheel}) = \frac{LV}{Radius} = \frac{\frac{1400\ \pi\ ft}{sec}}{\frac{4\ ft}{rad}} = \frac{1400\ \pi\ \cancel{ft}}{sec} \times \frac{rad}{4\ \cancel{ft}} =$$

$$= \frac{350\ \pi\ rad}{sec}$$

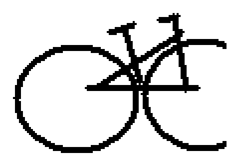
$$AV(rev/sec) = \frac{350\ \cancel{\pi}\ \cancel{rad}}{sec} \times \frac{1\ rev}{2\ \cancel{\pi}\ \cancel{rad}} = \frac{175\ rev}{sec}$$

8.

LV = AV X R

AV = LV / R

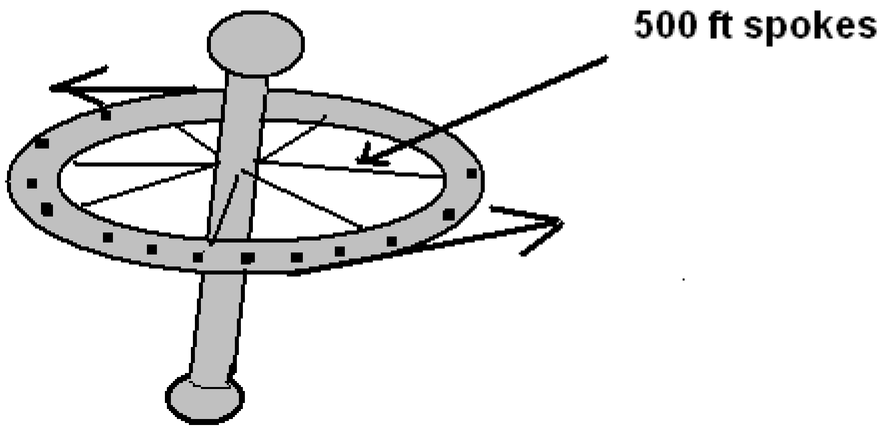
2.308 rad/sec



$$AV = \frac{\frac{5\ ft}{1\ sec}}{\frac{26\ in}{1\ rad}} = \frac{5\ \cancel{ft}}{1\ \cancel{sec}} \times \frac{1\ \cancel{rad}}{26\ \cancel{in}} \times \frac{12\ \cancel{in}}{1\ \cancel{ft}} \times \frac{1\ rot}{2\ pi\ \cancel{rad}} \times \frac{60\ \cancel{sec}}{min} =$$

$$= \frac{69.23\ rot}{pi\ \ min} = 22.037\ rot/min$$

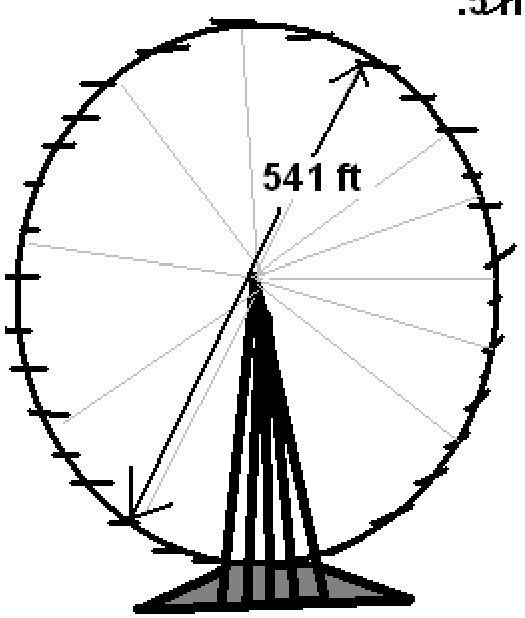
9.



$$LV = \frac{1\ rev}{2\ min} \times \frac{2\ \pi\ rad}{rev} \times \frac{500\ ft}{rad} \times \frac{1\ min}{60\ sec} = \boxed{\frac{8.34\pi\ ft}{sec}}$$

10.

$$LV = \frac{1\ rev}{.5\ hr} \times \frac{2\ \pi\ rad}{1\ rev} \times \frac{270.5\ ft}{1\ rad} \times \frac{1\ hr}{60\ min} =$$



$$\boxed{= \frac{18\ \pi\ ft}{min}}$$