Problem of the Week
Problem B and Solution
Take a Turn

Problem

Let's explore some 'turns' in different contexts.

a) Shredder does snowboard helicopter jumps with ease. If he rotates all the way around in a horizontal circle, through how many degrees does he rotate? What if he only rotates halfway around?

b) Through how many degrees does the minute hand on an analog clock move during
   i) $\frac{1}{4}$ hour (say from 12:45 to 1:00 o'clock)?
   ii) 1 minute (say from 12:59 to 1:00 o'clock)?

c) Through how many degrees does the hour hand move in one hour (say from 1:00 to 2:00 o'clock)?

d) If a clock is keeping time correctly, the minute hand rotates at a rate of $360°$ per hour. One day, Sam notices that the time on the clock and on her digital watch is the same at noon, but when her watch says 1:00 o'clock, the clock says 1:05. Assuming that Sam's digital watch keeps accurate time, at what rate is the minute hand of the clock rotating now?

Solution

a) In doing a full turn, Shredder rotates horizontally through $360°$; in a half turn, he rotates $180°$

b) i) Since the minute hand rotates through $360°$ in 1 hour, in $\frac{1}{4}$ hour, it rotates through $360° \div 4 = 90°$.

   ii) One minute is $\frac{1}{60}$ th of an hour. Since the minute hand rotates through $360°$ in 1 hour, in $\frac{1}{60}$ hour, it rotates through $360° \div 60 = 6°$.

c) In one hour, the hour hand moves $\frac{1}{12}$ of a full circle, or $360° \div 12 = 30°$

d) Assuming that Sam's digital watch keeps accurate time, the minute hand of the clock has moved an extra $\frac{1}{12}$ of a full circle in one hour of real time. Thus it is moving at a rate of $360° + 30° = 390°$ per hour.