

Let

$$f(h, m) = \left| 30h - \frac{11}{2}m \right|$$

where h and m corresponds to the time $h : m$.

The following formula can be used to determine the smaller angle between the hour hand and the minute hand:

$$S(h, m) = \text{angle between two hands} = \begin{cases} f(h, m), & \text{if } f(h, m) \leq 180^\circ \\ 360^\circ - f(h, m), & \text{if } f(h, m) > 180^\circ \end{cases}$$

Now, instead of 12:00 and 1:00, we will replace it with 00:00 and 00:60, resp., for easy computations. (Take note that using the formula on 12:00 will give us $360^\circ - \left| 30(12) - \frac{11}{2}(0) \right| = 0$.) Also, $f(12, 32) < 180^\circ$ while $f(12, 33) > 180^\circ$.

Thus, the sum of the angles is

$$\begin{aligned} \text{sum} &= \sum_{m=0}^{60} S(0, m) \\ &= \sum_{m=0}^{32} S(0, m) + \sum_{m=33}^{60} S(0, m) \\ &= \frac{11}{2} \sum_{m=0}^{32} m + 28(360) - \frac{11}{2} \sum_{m=33}^{60} m \\ &= \frac{11}{2} \frac{(32)(33)}{2} + 10080 - \frac{11}{2} \frac{(93)(28)}{2} \\ &= 2904 + 10080 - 7161 \\ &= 5823 \end{aligned}$$

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