According to Ampere's circuital law, the line integral of magnetic field induction along a closed curve is equal to the total current passing through the surface enclosed in the closed curve times the permeability of the medium.

$\oint B.dl = \mu_0 I_{enclosed}$

Applying ampere's law for the given toroid,

$B(2\pi r) = \mu_0 NI$

But, $N = 2\pi rn$

$B = \mu_0 nI$

(b)

The observer sees south pole as shown in the attached figure.
Magnetic moment due to a loop is given by:

$m = iA$

For N turns, $i = NI$

$m = NIA$ 2.A toroid is a solenoid bent into the form of a closed ring. The magnetic field lines of solenoid are straight lines parallel to the axis inside the solenoid

3.The number of turns per unit length is $n=5000.5=1000n=5000.5=1000$ turns/ m The length $l=0.5m$ and radius $r=0.01$ m Thus, $l/a=50$ i.e.,$l>>al/a=50$ i.e.,$l>>a$. Hence, we can use the long solenoid formula, namely, Eq. $(B=\mu_0 nI)B=\mu_0 nI(B=\mu_0 nI)B=\mu_0 nI$

$=4\pi\times10-7\times103\times5=6.28\times10-3T$ 4.$B=\mu_0 NI$

$2.25\times10-3=0.54\pi\times10-7\times500\times I$

$I=4\pi\times10-7\times5000.5\times2.25\times10-3$

$\therefore I=1.79\approx1.8A$