27. (a) Earth makes one rotation per day and 1 *d* is (24 h) (3600 s/h) = 8.64×10^4 s, so the angular speed of Earth is

$$\omega = \frac{2\pi \text{ rad}}{8.64\times10^4 \text{ s}} = 7.3\times10^{-5} \text{ rad/s}.$$

(b) We use $v = \omega r$, where r is the radius of its orbit. A point on Earth at a latitude of 40° moves along a circular path of radius $r = R \cos 40°$, where R is the radius of Earth (6.4×10^6 m). Therefore, its speed is

$$v = \omega(R\cos 40°) = (7.3\times10^{-5} \text{ rad/s})(6.4\times10^6 \text{ m})\cos 40° = 3.5\times10^2 \text{ m/s}.$$

(c) At the equator (and all other points on Earth) the value of ω is the same (7.3×10^{-5} rad/s).

(d) The latitude is 0° and the speed is

$$v = \omega R = (7.3\times10^{-5} \text{ rad/s})(6.4\times10^6 \text{ m}) = 4.6\times10^2 \text{ m/s}.$$