

Determining the Qibla

The need to know the direction of Mecca (the *Qibla*) from any site where Muslims pray led, starting in the eighth century, to important advances in both theory and computation [1, 2]. Mosques have various methods of indicating the correct direction. Those individuals who are not at a mosque use charts or special software. Considering the number of Muslims in the world it is probably not an exaggeration to state that the *Qibla* is the visual manifestation of mathematics that most directly affects daily life in the world.

The Ottawa mosque [10] is located at 45.401N, 75.742W. The data for Mecca differs in various sources, but we will use the value 21.418N, 39.831E. The bearing is 57.14° so that one prays in a north-easterly direction. Someone who was not aware of the need to follow a great circle route would find it strange that the *Qibla* points towards the province of Quebec instead of towards the south!

The graph of the bearing vector shows how the direction of prayer -- for a muslim wishing to pray en route to Mecca -- varies with the longitude. At the most northernly point (53.86N, 33.52W) the bearing is due east.

Bibliography

1. King, D. (1994). "Mathematics applied to aspects of religious ritual in Islam". In Grattan-Guinness, I., ed. *Companion Encyclopedia of the History and Philosophy of the Mathematical Sciences*. London: Routledge, Vol. 1, pp. 80-84. [The bibliography contains several items of interest.]
2. Van Brummelen, G. (2013) "Seeking the divine on earth: the direction of prayer in islam". *Math Horizons*. 21(1): 15-17.
3. Ottawa Mosque:
<https://www.openstreetmap.org/#map=17/45.40126/-75.74203>
https://en.wikipedia.org/wiki/Ottawa_Mosque.