

Problem 1 – The Van Allen Probe A spacecraft travels along its orbit from point A(+3,+4) to point B(+7,+4). Draw an arrowed segment showing the direction that the spacecraft is traveling.

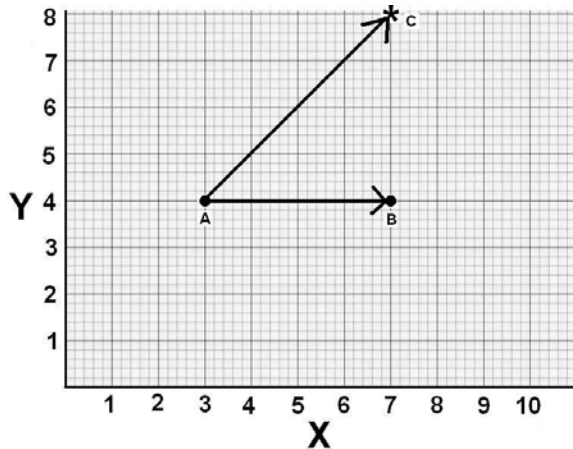
Problem 2 – Earth's magnetic field in this region of space passes through Point A, in the direction of Point C(+7, +8). Draw an arrowed segment showing the magnetic field direction.

Problem 3 – From the geometry of the triangle ABC, what angle does the magnetic field make to the direction of the spacecraft motion?

Problem 4 – If the strength of the magnetic field in the direction AC is 14 nanoTeslas, what would the 'shadows' of the magnetic field strength be along the directions AB and AC? (These are called the components of the magnetic field.)

Problem 1 – The Van Allen Probe A spacecraft travels along its orbit from point A(+3,+4) to point B(+7,+4). Draw an arrowed segment showing the direction that the spacecraft is traveling. Answer: See below.

Problem 2 – Earth’s magnetic field in this region of space passes through Point A, in the direction of Point C(+7, +8). Draw an arrowed segment showing the magnetic field direction.



Problem 3 – From the geometry of the triangle ABC, what angle does the magnetic field make to the direction of the spacecraft motion?

Answer: The horizontal segment AB is 4.0 units long and the vertical segment BC is 4.0 units long so this triangle is a 45:45:90 right triangle. The angle that AC makes to segment AB is then 45° .

Problem 4 – If the strength of the magnetic field in the direction AC is 14 nanoTeslas, what would the ‘shadows’ of the magnetic field strength be along the directions AB and AC? (These are called the components of the magnetic field.)

Answer: In a 45:45:90 right triangle, the side lengths are 1.0 and the hypotenuse is $\sqrt{2}$ so By using proportions, the sides of the ‘magnetic triangle’ with a hypotenuse of 14 nanoTeslas are $14 \text{ nanoTeslas} / \sqrt{2} = 14 \text{ nanoTeslas} / 1.4 = 10 \text{ nanoTeslas}$. So the components to the magnetic field are +10 nanoTeslas along direction AB and +10 nanoTeslas along direction BC. We can also write this as (+10 nT, +10nT)