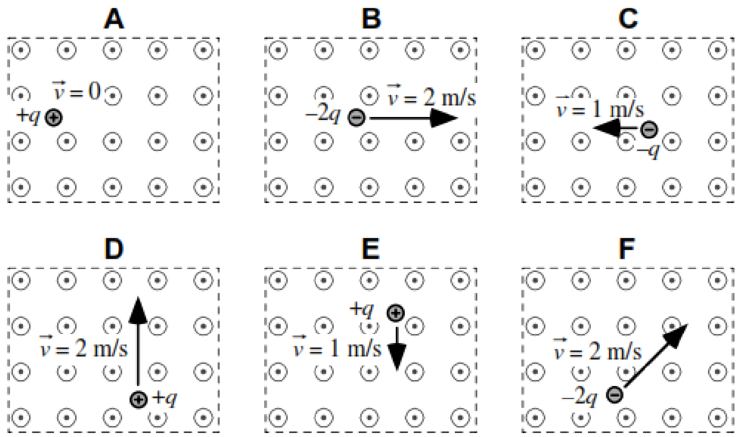
AP Physics 2 – Magnetic Fields and Forces

D3-RT05: Charge within a Uniform Magnetic Field—Magnetic Force

In each case, charged particles are in a magnetic uniform magnetic field. All magnetic fields have the same strength.



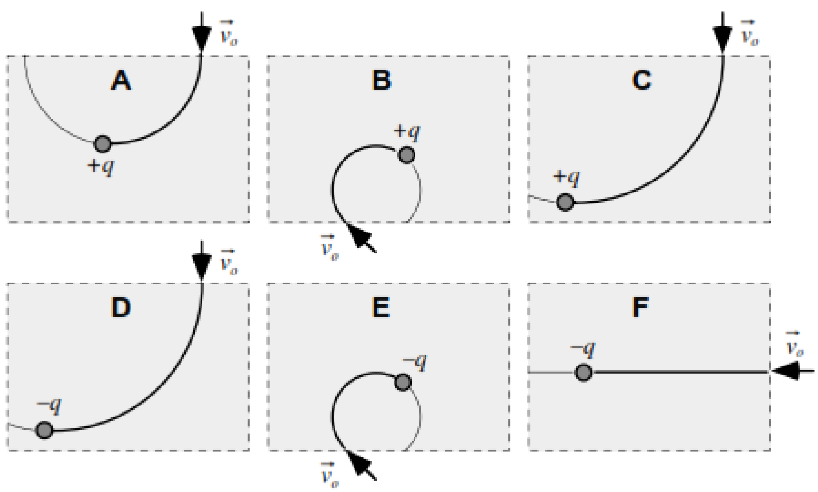
Rank the strength (magnitude) of the magnetic force on each charge.

						OR			
1 Greatest	2	3	4	5	6 Least		All the same	All zero	Cannot determine

Explain your reasoning.

D3-RT07: Moving Charge Path—Direction and Strength of the Magnetic Field

In each case, the shaded region contains a uniform magnetic field that may point either into the page or out of the page. A charged particle moves through the region along the path indicated. All of the charged particles have the same mass and enter the region with the same initial speed.



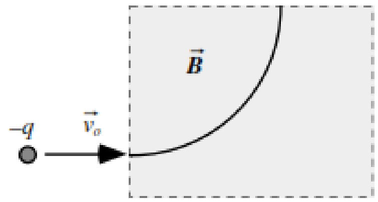
Rank the magnetic field in the region. Fields directed out of the page (considered positive) are ranked higher than fields directed into the page (considered negative).

						OR			
1 Greatest	2	3	4	5	6 Least		All the same	All zero	Cannot determine

Explain your reasoning.

D3-QRT09: CHARGED PARTICLE AND A UNIFORM MAGNETIC FIELD—PATH

The dark quarter-circle indicates the path of a negatively charged particle as it passes through a region containing a uniform magnetic field.



(a) What is the direction of the magnetic field in the shaded region?
Explain your reasoning.

(b) If we double the speed of the particle, how will the path change?
Explain your reasoning.

(c) If we double the magnitude of the uniform magnetic field, how will the path change?
Explain your reasoning.

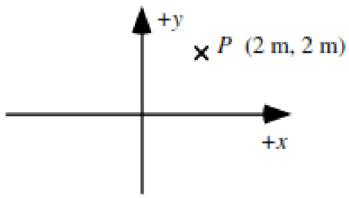
(d) If we replace the original particle with a negative particle of twice the charge and the same mass, how will the path change?
Explain your reasoning.

(e) If we replace the original particle with a positive particle of the same mass and same magnitude charge as the original negative charge, how will the path change?
Explain your reasoning.

(f) If we replace the original particle with a negative particle of twice the mass and the same charge, how will the path change?
Explain your reasoning.

D3-RT12: Moving Charges in Uniform Magnetic Field—Acceleration

Moving charged particles are released at point P (2 m, 2 m) in a region of space with a uniform magnetic field in the $+x$ direction. All these particles have the same mass, and they are released one at a time into the field with the given velocities.



Case	Charge	Speed	Direction
A	+5 mC	3 m/s	$+x$
B	+5 mC	3 m/s	$-x$
C	–10 mC	5 m/s	$+y$
D	–10 mC	5 m/s	$-y$

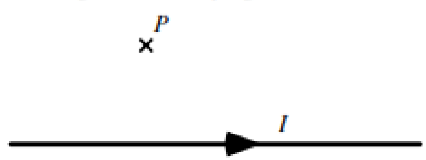
Rank the magnitude of the initial acceleration of the charged particles as they are released from *P*.

1 Greatest	2	3	4 Least	OR	All the same	All zero	Cannot determine

Explain your reasoning.

D3-QRT17: Straight Current–Carrying Wire—Magnetic Field Nearby

The figure below shows a point P near a long current-carrying wire.



(a) What is the direction of the magnetic field at point *P* due to the current in the wire?

Explain your reasoning.

(b) What would the direction of the magnetic field at point *P* be if the current in the wire were reversed?

Explain your reasoning.

(c) What would happen to the magnetic field at point *P* if the current in the wire were increased?

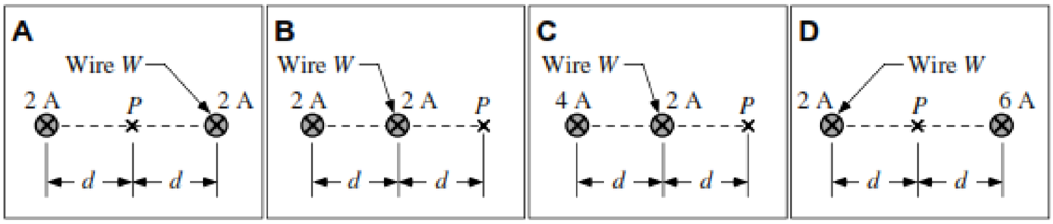
Explain your reasoning.

(d) What would happen to the magnetic field at *P* if point *P* were farther away from the wire?

Explain your reasoning.

D3-RT22: CURRENT–CARRYING STRAIGHT WIRES—MAGNETIC FIELD NEARBY

In these cases, long, straight wires that are perpendicular to the page are carrying electric currents into the page.



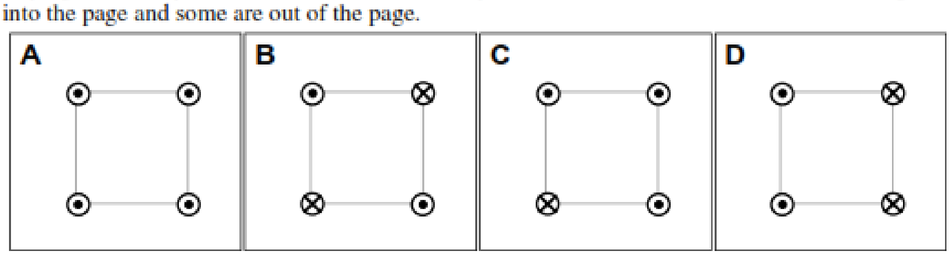
Rank the strength (magnitude) of the magnetic field at *P* due to wire *W*.

1 Greatest	2	3	4 Least	OR	All the same	All zero	Cannot determine

Explain your reasoning.

D3-RT24: CURRENTS AT CORNERS OF SQUARES—MAGNETIC FIELD AT CENTER

Current-carrying wires are positioned at the corners of a square. All of the currents have the same magnitude, but some are into the page and some are out of the page.



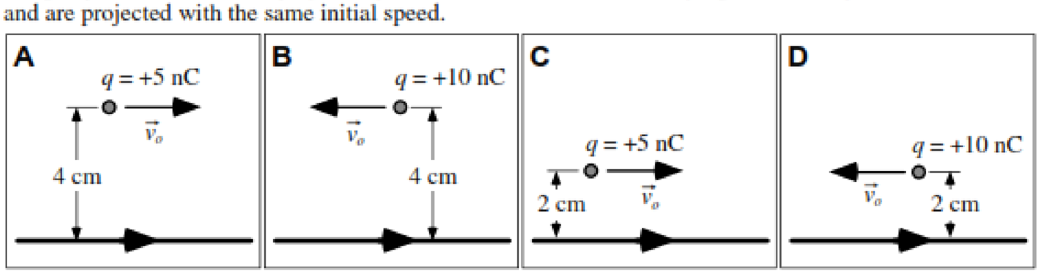
Rank the magnitude of the net magnetic field at the center of the square.

1 Greatest	2	3	4 Least	OR	All the same	All zero	Cannot determine

Explain your reasoning.

D3-RT28: MOVING CHARGE ALONG A STRAIGHT CURRENT–CARRYING WIRE—ACCELERATION

Four charged particles have been projected parallel to identical current-carrying wires. The particles have the same mass and are projected with the same initial speed.



Rank the magnitude of the acceleration of each charge at the instant shown.

1 Greatest	2	3	4 Least	OR	All the same	All zero	Cannot determine

Explain your reasoning.