Here's how to set up file and directory permissions with encryption for MySQL securely on Ubuntu following CIS benchmarks:

File System Permissions:

- **Minimize Permissions:** Grant users and processes only the minimum permissions required to access MySQL data directories and files. The CIS benchmarks likely recommend restricting access to the MySQL data directory (/var/lib/mysql by default) for most users.

Recommended Permissions:

- The MySQL server process should own the MySQL data directory (/var/lib/mysql) and its subdirectories.
- The MySQL group (usually mysql) should have group ownership of the data directory.
- Other users and groups should have minimal or no permissions to the directory and its contents.

Setting Permissions:

- Use the chown and chgrp commands to change ownership of directories and files.
- Use the chmod command to modify file and directory permissions. Here's an example:

```
sudo chown mysql:mysql /var/lib/mysql -R  # Change ownership recursively
sudo chmod 700 /var/lib/mysql  # Set permissions for directory (read, write, execute for owner only)
```

Encryption at Rest (Optional):

- The CIS benchmarks might recommend implementing encryption at rest for the MySQL data directory. This encrypts the data on disk, adding an extra layer of security in case of physical server access.

Encryption Options:

- **Disk Encryption:** Consider using full disk encryption tools like dm-crypt or LUKS to encrypt the entire disk where the MySQL data resides.
- **File-Level Encryption:** Explore tools like EncFS for encrypting specific directories at the file system level. This can be more granular but might require additional configuration.

Important Considerations:

- **Performance Impact:** Encryption adds some processing overhead. Evaluate the performance impact on your specific database workload before implementing encryption at rest.

- **Recovery Complexity:** Encrypted backups require the decryption key to be restored. Ensure proper key management procedures are in place for recovery purposes.

Additional Resources:

- CIS MySQL Security Benchmarks (reference security guides that mention these benchmarks): While not directly available online, security guides referencing CIS benchmarks can offer details. Search for "CIS MySQL Security Benchmarks Ubuntu".
- MySQL documentation on data directory: https://stackoverflow.com/questions/1795176/how-to-change-mysql-data-directory
- Ubuntu documentation on disk encryption: https://ubuntu.com/ceph/docs/encryption-at-rest (Consider searching for specific encryption tools like dm-crypt or EncFS for more detailed instructions)

Remember:

- The specific permission settings might differ slightly depending on your environment and additional applications using MySQL.
- Carefully review the CIS benchmarks for your Ubuntu version to ensure you adhere to their specific recommendations.
- Evaluate the trade-offs between security and performance when considering encryption at rest.