CASE STUDY TASK:

Reasons why employees might be receiving the same announcement more than once:

1. Overlapping Cron Jobs:
   If the script takes longer to run than the interval between executions, it could lead to overlapping runs where a new instance starts before the previous one finishes. This can cause the script to send messages more than once.

2. System Time or Timezone Issues:
   If the system time or timezone is incorrectly set or changes (due to daylight saving time adjustments or manual changes), it might cause cron jobs to execute at unexpected times, potentially leading to unexpected behavior including sending messages multiple times.

Approach I took for fix:
Ensuring idempotency to the task execution. If the cron job is executed multiple times, the action of sending a message is performed only once due to adding a condition of adding a unique identifier, and checking that a message is not sent more than once with the identifier.

In the models, a `SentMessage` model is created that has a `unique_id`, where each message created will have a code, and in the cron job a check is made to see if a message with the same `id` has been sent. If yes, an exception is logged. Else, the announcement will be sent.

ReadMe file explains how to run the project locally

Improvements/Difficulties:

Despite being given enough a decent time limit to complete the task, due to work/client commitments, personal responsibility and accountability was a big failure here. The app runs, but has bugs and failing tests

Improvements that can be done:
1. On the celery task, a error could be logged instead of printing out the success/failure of the announcement message, and logs be configured directly to the deployment environment
2. Have working code and tests
3. Improve on the efficiency of the celery task itself, after running further live testing, to see if it may have the same task execution issues
4. Right more unit tests than present, once that also test timestamp issues