MANOR SCHOOL SPORTS COLLEGE

Year 11 into 12 Summer Transition Task

Subject	**Computer Science**

Qualification/Level: A Level
Examination Board: OCR

The following tasks are to be completed over the summer break and handed in to the sixth form leaders on your first day of sixth form. Please clearly label work with your name and subject. If you have one, please place work in a clear plastic wallet.

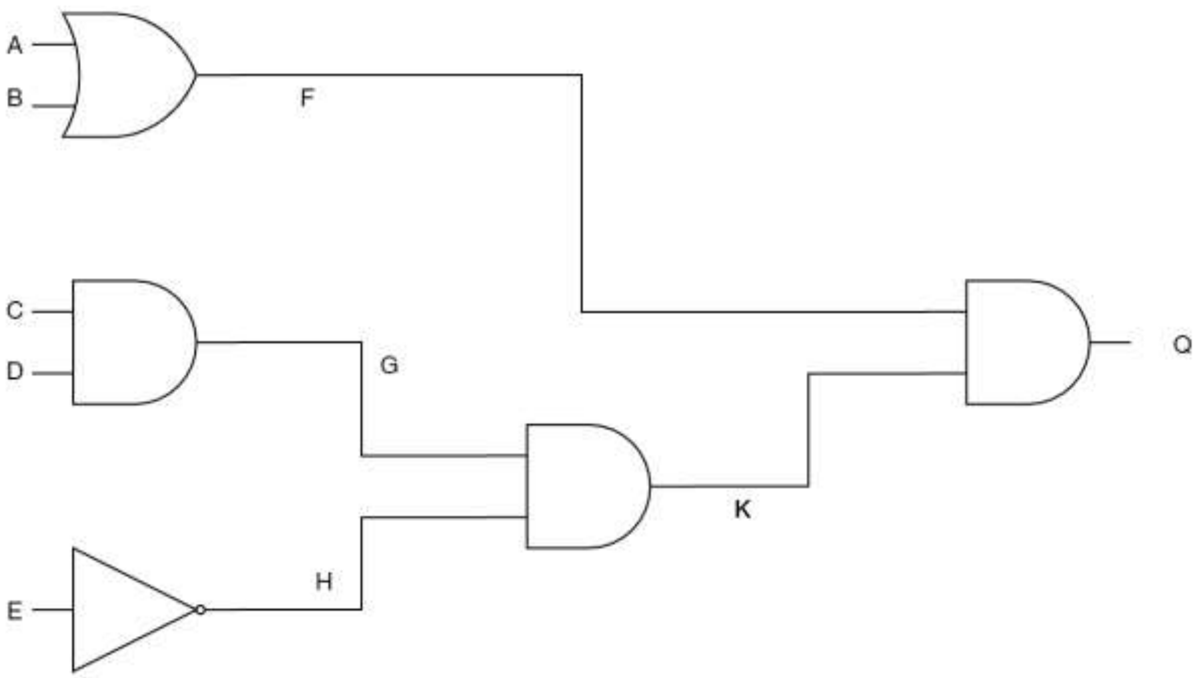
TASK 1: Watch the Transition to A Level Video [HERE].

TASK 2: Complete the questions below based on the content of the video. Write your answers on a piece of paper to be handed in on your first day in the Sixth Form.

1. Create a truth table for the XOR logic gate.

2. Draw logic circuits for the following Boolean expressions:
   a. $Q = A \underline{\vee} B \vee \neg B$
   b. $Q = \neg A \wedge B \vee C$
   c. $Q = \neg(A \vee B) \vee (A \wedge C)$

3. The figure below shows a logic circuit.



   a. Write the equivalent Boolean expression.
   b. What are the values of F, G, H, K and Q if A, B, C, D and E are all equal to 1?

4. Three sensors A, B and C are used to monitor a process. A signal X is output from the circuit. X has the value of 1 if either of the following conditions below are met. Draw a logic circuit to represent the conditions.
   - Sensor A outputs 1 AND sensor B outputs 0
   - Sensor B outputs 1 OR sensor C outputs 0

TASK 3: Create the truth tables to prove each of the Boolean algebra rules. You will need 2 truth tables for each of the rules (34 tables in total)

General rules
1. X ^ 0 = 0
2. X ^ 1 = 1
3. X ^ X = X
4. X ^ ¬X = 0
5. X v 0 = X
6. X v 1 = 1
7. X v X = X
8. X v ¬X = 1

Commutative rules
9. X ^ Y = Y ^ X
10. X v Y = Y v X

Associative rules
11. X ^ (Y ^ Z) = (X ^ Y) ^ Z
12. X v (Y v Z) = (X v Y) v Z.

Distributive rules
13. X ^ (Y v Z) = (X ^ Y) v (X ^ Z)
14. (X v Y) ^ (W v Z) = (X ^ W) v (X ^ Z) v (Y ^ W) v (Y ^Z)

Absorption rules
15. X v (X ^ Y) = X
16. X ^ (X v Y) = X

Double negation
17. X = ¬¬X

TASK 4: Program planning. Create a plan for the program outlined below. Do this in the form of structured English/pseudocode/flowcharts or whatever most suits you. Do not create the program. What we are looking for is your algorithmic thinking.

Louise is creating a card game for two players. The game uses a deck of cards. Each deck has 30 cards in it with each card having one colour (red, black or yellow). Each card is assigned a number 1-10 for each card so each card is unique. The 30 cards are shuffled and stored in the deck.

The rules are:
- Player 1 takes the top card from the deck.
- Player 2 takes the next card from the deck.
- If both players have a card of the same colour, the player with the highest number wins.
- If both players have cards with different colours, the winning colour is shown in the table below:
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Card	Card	Winner
Red	Black	Red
Yellow	Red	Yellow
Black	Yellow	Black

- The winner of each round keeps both cards.
- The players keep playing until there are no cards left in the deck.
- The player at the end of the game with the highest total score of all cards wins.

If you have any questions, please email compandbus@manor.school or cbateman@manor.school