



ULTIMATE REVISION

2024 A/L ICT

The ultimate battle awaits

STUDENT ID

UMR – 1.1

DATE

1. Using just the basic rules, simplify the expressions below showing your working out when there is more than one stage to the simplification. Sometimes the commutative and associative laws may also help you answer the questions.

1) $A + A$

2) $B + B$

3) $A.B + A.B$

4) $D.F + D.F + G$

5) $D.E + A.\bar{B} + D.E$

6) $A.A$

7) $H.H$

8) $(A + B).(A + B)$

9) $X.Y.X$

10) $B.1$

11) $C + 0$

12) $A.B.A.C.1$

13) $D + 0$

14) $A.B + 0$

15) $E.1$

16) $E.0$

17) $(A + A.B).0$

18) $A.B.1$

19) $\overline{\overline{D}}$

20) $\overline{\overline{B + B}}$



2. Using just the basic rules, simplify the expressions below showing your working out. Sometimes the commutative and associative laws may also help you answer the questions.

1) $C + C.D$

2) $D + C.D.B$

3) $A.(C + A)$

4) $D.F + D.1$

5) $E.F.(E.F + D)$

6) $A.A + A.1 + B.\bar{B}$

7) $A.B.B.C + A.0.B + A.C.B.D$

8) $A.B.(0 + \bar{A}) + 1$

9) $\bar{D}.(E + \bar{D})$

10) $F.(F + 1)$

11) $E.F + F.G.E$

12) $\overline{\overline{B.C}} + \bar{C}$

13) $A.B.(A + A.B)$

14) $A.B.\bar{C} + A.\bar{C}$

15) $A.\bar{D}.(C + A.\bar{D})$

16) $\overline{C.D.D.E} + \overline{C.E}$

17) $A + B.A + B.A.C$

18) $E.(E + 1)$

19) $\bar{D} + D.0$

20) $A + A.\bar{A}$

21) $\overline{\overline{B + B.B}}$

22) $C.A.B.(A.B + D)$

23) $(A.\bar{G} + A.1).A$

24) $B.A + A$

25) $A.(A + B).\bar{1}$

26) $A.B.(A.B + E) + A.\overline{\overline{\overline{B}}}$

3. For questions 1-6, expand the brackets in the expressions. Do not simplify the resulting expressions.

1) $C.(D + B)$

2) $C.D.(B + A.E)$

3) $A.(C + B + E + D)$

4) $D.(F + E.(A + B))$

5) $E.F.(\overline{T.R} + D)$

6) $A.(B + C + D) + A.(\overline{B + E.(B + C)})$

4. For questions 7-12, factorize the expressions. Do not simplify the resulting expressions. There are two correct answers for q12 – make sure you write down both of them.

7) $C.D + C.B$

8) $C.D.B + B.A.E$

9) $A.C + C.B + E.C$

10) $D.F + D.(A + B)$

11) $E.F + E.\overline{F}$

12) $A.1 + A.1$

5. For questions 13-22, **simplify the expressions** using just the basic rules and, if helpful, bracket expansion, factorization, associative laws and commutative laws. Show your working out. There are many ways of simplifying **question 20** that end up getting to the correct answer – make sure you write down at least two of them.

13) $\overline{B}.(D + B)$

14) $C.D.(D.B + C)$

15) $A.(C + B + \overline{A})$

16) $D.(F + D.(A + \overline{F}))$

17) $E.0.(\overline{T.R} + D)$

18) $D.E + E.\overline{D}$

19) $A.B.C + A.B.C$

20) $A.(B + 0 + D).(A.(\overline{B} + D.(B + \overline{A})))$

21) $\overline{H} + \overline{H}.J$

22) $\overline{\overline{A.B.C} + 0 + A.1.\overline{B}} + 1$

6. Use **De Morgan's laws**, and any other rules that will help, to simplify the expressions below showing your working out when there is more than one stage to the simplification.

1) $\overline{\overline{C + D}}$

2) $\overline{\overline{C + F}}$

3) $\overline{\overline{A + B} + A}$

4) $\overline{\overline{A.D}}$

5) $\overline{\overline{R.D.B}}$

6) $\overline{\overline{A.E}} + A.D$

7) $\overline{\overline{D + B.B}}$

8) $\overline{\overline{D.E.D}} + \overline{\overline{E}}$

7. For each of the equations below state if they are true (both sides of the equation are equal to each other) or false. If it is false, show what the left-hand side of the equation simplifies to.

9) $\overline{\overline{C + D}} = C + D$

10) $\overline{\overline{\overline{F}}} = \overline{F}$

11) $A + A = 1$

12) $V.V = V$

13) $B.\overline{B} = 1$

14) $\overline{\overline{A.D}} = A.D$

15) $B + B.C = C$

16) $\overline{\overline{D.E}} + 0 = 0$

17) $\overline{A}.0 = A$

18) $X.(X + \overline{Y}) = X$

19) $\overline{\overline{M.N}} = M + N$

20) $0.A + B = 0$

8. For questions 1–8, state how many different places there are where De Morgan's Laws can be applied in the given expression and simplify the expression.

1) $C + B$

2) $\overline{\overline{C + F}}$

3) $\overline{\overline{A + B} + A}$

4) $\overline{\overline{A.D}}$

5) $\overline{\overline{R.D.B}}$

6) $\overline{\overline{A.E}} + A.D$

7) $\overline{\overline{D + B.B}}$

8) $\overline{\overline{D.E.D}} + \overline{\overline{E}}$



9. For each of the expressions in questions 9-14, show the results of applying De Morgan's Laws in each of the places they can be applied. Do not use any other simplification rules.

9) $C + D + E$

10) $\overline{F.E}$

11) $A.B + \overline{C}$

12) $(V + \overline{U + W}).X$