designclass
design | engineering | technology

ADVANCED HIGHER
GRAPHIC COMMUNICATION

PROJECT 01 | MISSION SUMMIT-X

CAD & ENGINEERING GRAPHICS

Six homeworks that go with the course notes and worksheets. Each one practises the newest topic and brings back earlier ones, so nothing is forgotten before the exam.



HOMEWORK PACK

PUPIL · PRINT EDITION

56° 40′ N · 5° 06′ W
GLEN COE

01 GRAPHICS & STANDARDS

Creators, users, graphic types, line types and dimensioning.

HOMEWORK 01
13 MARKS · 30 MIN
AFTER WORKSHEETS 01–02

NAME _____ CLASS _____ DATE _____

1 State the type of graphic each SUMMIT-X user needs.

(a) The HSRDU trustees deciding whether to fund the project.

_____ 1

(b) The CNC machinist making the motor mounts.

_____ 1

(c) Volunteers replacing a damaged arm on the hill.

_____ 1

2 Fig 1 shows five BS 8888 line types, A to E. Name each line type and state **one** use of it.



Fig 1 Line types A–E.

A _____

B _____

C _____

D _____

E _____ 5

3 The twelve holes in the frame plate are dimensioned from one datum (parallel dimensioning), not as a chain. Explain **two** reasons why.

2

4 State what “PCD 25” means on the motor-mount drawing.

1

5 Sketch the third-angle projection symbol.

SKETCH HERE

2

designclass design | engineering | technology © DesignClass 2026 · designclass.co.uk

HOMEWORK 01 · 13 MARKS

02 SECTIONS

Section types, hatching rules and cutting planes.

HOMEWORK 02
12 MARKS · 30 MIN
AFTER WORKSHEET 03

NAME _____ CLASS _____ DATE _____

1 Name the type of sectional view described.

(a) The section is turned through 90° and drawn on the view itself.

_____ 1

(b) Parallel cutting planes are joined by steps to cut several features at once.

_____ 1

(c) A small local area is broken out, bounded by a thin freehand line.

_____ 1

(d) A symmetrical part is drawn half in section and half as an outside view.

_____ 1

2 State **three** parts that are not hatched when the cutting plane runs along their length.

_____

_____ 3

3 Explain why two parts that touch in a sectional assembly are hatched in opposite directions.

_____

_____ 1

4 Describe how a cutting plane is drawn and labelled on a view. RETRIEVAL · HW1

_____

_____

_____ 2

5 Explain why hidden detail is not dimensioned. RETRIEVAL · HW1

_____

_____ 2

designclass design | engineering | technology © DesignClass 2026 · designclass.co.uk

03 TOLERANCES & TEXTURE

Limits, fits, surface texture and datums.

HOMEWORK 03
15 MARKS · 35 MIN
AFTER WORKSHEET 04

NAME _____ CLASS _____ DATE _____

1 A Ø12 pin (h6: 12,000 / 11,989) fits a Ø12 H7 hole (12,018 / 12,000).

(a) Calculate the maximum and minimum clearance.

2

(b) State the type of fit.

1

2 A size is shown as 45 ± 0,2. State its limits and its tolerance.

2

3 A size is shown as 30 with deviations +0,1 and −0,05. State its limits and its tolerance.

2

4 Describe what the symbol in Fig 1 tells the manufacturer.

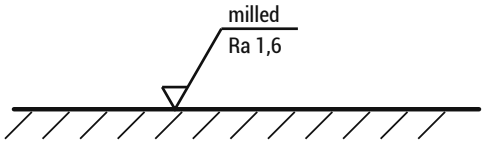


Fig 1 Surface texture symbol.

2

5 Explain why datum targets are used on a sand-cast part.

2

6 State the type of sectional view that shows a long arm's changing cross-section away from the view, with a label. RETRIEVAL · HW2

1

7 State what the letter F next to a dimension means. RETRIEVAL · WS04

1

8 Sketch the complete surface texture symbol for: material must **not** be removed, Ra 6,3, on all surfaces around the outline.

SKETCH HERE

2

designclass design | engineering | technology © DesignClass 2026 · designclass.co.uk

HOMEWORK 03 · 15 MARKS

04 3D CAD MODELLING

Sweeps, lofts, edges and Booleans.

HOMEWORK 04
10 MARKS · 35 MIN
AFTER WORKSHEET 05

NAME _____ CLASS _____ DATE _____

1 Fig 1 shows the path and profile for a carry handle on the searchlight. Describe how the handle would be modelled in 3D CAD.

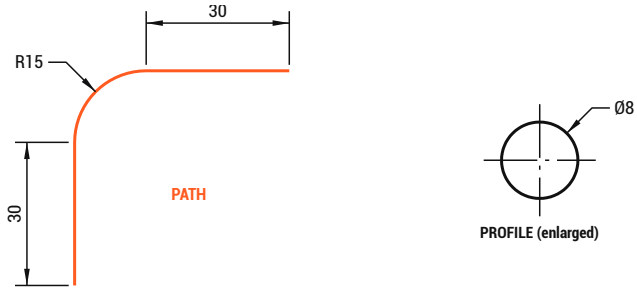


Fig 1 Searchlight carry handle: path and profile.

3

2 Explain the difference between a loft and a loft with rails.

2

3 State the information the software needs to create a variable fillet.

2

4 Explain the difference between a Boolean subtract and a slice.

2

5 State the type of fit given by Ø18 H7/s6. RETRIEVAL · HW3

1

designclass design | engineering | technology © DesignClass 2026 · designclass.co.uk

05 SIMULATION

FEA, CFD and mechanical animation.

HOMEWORK 05
12 MARKS · 35 MIN
AFTER WORKSHEET 06

NAME _____ CLASS _____ DATE _____

1 FEA of a PA12 canopy clip gives a peak von Mises stress of 12 MPa. PA12 has a tensile strength of 48 MPa. Calculate the factor of safety and state what it shows.

_____

_____ **2**

2 Explain why the FEA mesh is made finer around holes and sharp corners.

_____

_____ **2**

3 A CFD test models SUMMIT-X at a mountain rescue post 600 m up, where the air pressure is 94 300 Pa and the temperature is 5 °C.

(a) Calculate the air density using density = $p \div (R \times T)$, with R = 287 J/(kg·K) and T in kelvin.

_____

_____ **2**

(b) State **two** flow conditions that must also be set for this test.

_____

_____ **2**

4 Name the joint used to animate the thermal camera panning left and right.

_____ **1**

5 State what "stitch" does in surface modelling. RETRIEVAL · HW4

_____ **1**

6 Explain why specifying Ra 0,8 on every face of the motor mount would waste money. RETRIEVAL · HW3

_____

_____ **2**

© DesignClass 2026 · designclass.co.uk

06

CAD/CAM & THE BUILT ENVIRONMENT

Model data, file formats, levels and drainage.

HOMEWORK 06
15 MARKS · 40 MIN
AFTER WORKSHEETS 07–08

NAME _____ CLASS _____ DATE _____

1 The arm has a volume of 72 409.8 mm³ and is made of CFRP with a density of 1390 kg/m³. Calculate its mass in grams.

2

2 Explain why the canopy STL could arrive at the print bureau 25.4 times too large.

2

3 Explain why the motor mount is sent to a machinist as a STEP file.

2

4 Storm chamber S1 has a cover level of 20.50 and an invert level of 19.90. The pipe to S2 (IL 19.77) is 13.15 m long.

(a) Calculate the depth of S1.

1

(b) Calculate the gradient of the pipe from S1 to S2 as 1 : *n*.

2

5 State the usual scale of a location plan for a rural site, and how the site is marked on it.

2

6 State what a factor of safety below 1 predicts. RETRIEVAL · HW5

1

7 State the graphic type a town planner uses to find where SUMMIT Base is. RETRIEVAL · HW1

1

8 Sketch the BS floor-plan symbols for a socket outlet on a wall and a one-way switch beside a door.

SKETCH HERE

2

designclass design | engineering | technology © DesignClass 2026 · designclass.co.uk

HOMEWORK 06 · 15 MARKS

designclass
design | engineering | technology

CAD & ENGINEERING GRAPHICS

ADVANCED HIGHER GRAPHIC COMMUNICATION · PROJECT 01

Free resources for Scottish pupils and teachers of design, engineering and technology. Course notes, worksheets, drawings and CAD files at **designclass.co.uk**

Course content referenced from the Qualifications Scotland Advanced Higher Graphic Communication Course Specification. SUMMIT-X, the Highland Search & Rescue Drone Unit and SUMMIT Base are fictional. All models, drawings and graphics © DesignClass 2026.