Fill in these boxes and read what is printed below.

Full name of centre                      Town

Forename(s)                     Surname                      Number of seat

Date of birth  
Day  Month  Year

Scottish candidate number

Total marks — 80

Attempt ALL questions.

All dimensions are in mm.

All technical sketches and drawings use third angle projection.

You may use rulers, compasses or trammels for measuring.

In all questions you may use sketches and annotations to support your answer if you wish.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use blue or black ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.
1. A manufacturing company has produced an excavator toy, which is shown below.

A CAD technician working for the company used bottom up modelling to create the individual parts. Sub-assemblies were then produced before being joined in the final model.

Drawings generated from the model are shown on the Supplementary Sheets 1 and 2 for use with Question 1.
1. (continued)

(a) Describe the 3D CAD constraints used to assemble the lever bend to the lever extension. You may use sketches to support your answer.

You should refer to the left-hand lever sub-assembly shown on Supplementary Sheet 1 for use with Question 1(a).
1. (continued)

(b) On Supplementary Sheet 2 for use with Question 1(b) various views and a dimension have been annotated with the letters A to C.

Name each view or dimension and describe the information that it would provide to the manufacturer. You must use the correct British Standard terms.

(i) View A

(ii) View B

(iii) Dimension C
1. (continued)

(c) A problem has been identified with the seat of the excavator toy and a redesign is required. Specific information about the current seat is saved within the following file formats — .DWG, .STL and .3DS

Explain how the information contained in these files would be used in the redesign of the replacement seat.

(i) .DWG

(ii) .STL

(iii) .3DS

[Turn over]
1. (continued)

(d) A CAD illustration of the seat detail is produced. The stages of creating this detail are shown below. Stage 4 shows the final illustration.

![Stage 1](image1)
![Stage 2](image2)
![Stage 3](image3)
![Stage 4](image4)
1. (d) (continued)

Name the computer-aided techniques which have been applied between the following stages of the process and explain how they have been used.

(i) Stage 1 to Stage 2

(ii) Stage 2 to Stage 3

(iii) Stage 3 to Stage 4

[Turn over]
1. (continued)

(e) A presentation about the excavator toy is to be created in printed and digital media using a variety of file types.

(i) State the name of a file type that could be used to show an animation of how the excavator toy is assembled.

(ii) State the name of a vector file type that could be used to show a rendered image of the finished excavator toy.

(iii) The printed presentation takes the form of a poster, which includes both images and text.

Explain what would need to be considered by the designer prior to the poster being sent to the print technician.
2. A vacuum cleaner manufacturer uses motion capture technology as a test procedure to ensure that their products are easy and comfortable to use. An image of the test is shown below.

(a) Motion capture has advantages and disadvantages.

(i) Describe three advantages of motion capture technology to the manufacturer.
2. (a) (continued)

(ii) Describe three disadvantages of motion capture technology to the manufacturer.

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[Turn over
2. (continued)

(b) After testing, the manufacturer wants to design a new nozzle. Two designs are being considered.

You should refer to Supplementary Sheets 3 and 4 for use with Questions 2b(i) and (ii). Nozzle 1 is shown on Supplementary Sheet 3. Nozzle 2 is shown on Supplementary Sheet 4.

Describe the 3D CAD modelling techniques used to create the two replacement nozzles. You may use sketches to support your answer. Dimensions do not need to be included in your responses.

(i) Nozzle 1
2. (b) (continued)

(ii) Nozzle 2

[Turn over]
2. (continued)

The 3D CAD models of the nozzles are being tested using Finite Element Analysis (FEA) methods.

The results of the test on Nozzle 1 are shown below.

Type: Von Mises Stress
Unit: Pa
06/04/2016, 13:54:28

(c) Describe four set-up requirements that are necessary before the FEA simulation test can begin.
2. (continued)

An orthographic CAD drawing of Nozzle 1 is shown below.

(d) Identify three pieces of information which have been included in the orthographic views shown above and explain how they would allow the nozzle to be manufactured using CAD CAM processes.
3. A company has launched a series of products that carry the same branding. The graphic designer has maintained the brand across a range of products and a website using design elements and principles.

Special K website homepage

(a) Identify four design elements or principles and explain how they have been used in the web page shown above.

1

2

3

4
3. (a) (continued)

4

(b) It is important that the branding on the web page exactly matches that on the product packaging. Three examples of this packaging are shown below.

Coated cardboard and foil yoghurt container with plastic lid

Plastic packaging for individual cereal bars

Coated cardboard packaging for biscuits

Describe three factors that a company may have to consider when maintaining consistency across digital and printed media. You must mention specific printed and digital media in your responses. 3
3. (continued)

(c) A camera-ready copy of the biscuit packaging is produced.

Describe four requirements of a camera-ready copy for commercial printing.

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(d) State a suitable printing process to mass produce the cardboard biscuit packaging.

______________________________________________________________________
3. (continued)

(e) Food manufacturers are required to display nutritional information on food packaging.

Two examples are shown below.

![Label 1](image1)

![Label 2](image2)

Explain, with reference to the labels shown above, how graphic techniques have been used to make the nutritional information as clear as possible.

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[Turn over
4. The Kelpies and surrounding Helix Park have become a popular tourist attraction in the heart of Scotland.

(a) Prior to the construction of the Kelpies and Helix Park, three different surveys were undertaken.

Name three surveys and explain their purpose in ensuring the success of this project.

Survey 1

Purpose


4. (a) (continued)

Survey 2

Purpose

Survey 3

Purpose
4. (continued)

(b) Many professionals from the built environment sector were involved in the design and construction of the Kelpies sculptures. These included a model maker, structural engineer and a representative from the construction trades.

During the project they all made use of a computer generated 3D model of the sculptures.

Describe two ways the following professions could make use of the 3D computer model. You must give different answers for each profession.

(i) model maker

(ii) structural engineer

(iii) construction trades
5. Advances in technology have changed the way in which we access information.

(a) Describe three ways an advertiser can use digital media to appeal to the consumer.

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A website called “foodfactsaware.com” helps consumers understand more about information displayed on food packaging. The web page shown in the image below features drop down menus allowing consumers to access additional content. This takes the form of video interviews with professionals, printable fact sheets on nutrition and annotated photographs explaining food labelling.

(b) Explain how the web designer has made the website shown above informative and easy to use, with reference to the following.

(i) Web page layout
5. (b) (continued)

(ii) User interface

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(iii) Graphic media file formats

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[END OF QUESTION PAPER]
Acknowledgement of Copyright

Question 2  uu8 mmphotographie.de/shutterstock

Question 3(a) and (b)  Images of Kelloggs Special K products and screenshot of Kelloggs Special K homepage.

SQA has made every effort to trace the owners of copyright materials in this question paper, and seek permissions. We will be happy to incorporate any missing acknowledgements. Please contact janine.anderson@sqa.org.uk.

Question 3(b)  Label 1 – Danicek/shutterstock.com
Label 2 – SQA 2016

Question 4 (Image on left)  Aerial photograph of the Kelpies by Ken Whitcomb is reproduced by permission of Aerial Photography Solutions. © Photo: Aerial Photography Solutions.

Question 4 (Image on right)  Visitor’s map of Helix Park is taken from (www.thehelix.co.uk). Reproduced by kind permission of The Helix (Falkirk Community Trust).

Question 5(a)  Nata-Lia/shutterstock.com

Question 5(b)  jill-erin/shutterstock.com
miunicaneurona/shutterstock.com
Linda Vostrovska/shutterstock.com
Abel Tumik/shutterstock.com
udra11/shutterstock.com
Bernd Leitner Fotodesign/shutterstock.com
Supplementary sheets for use with Questions 1 and 2.
Supplementary Sheet 1 for use with Question 1(a)

LEFT-HAND LEVER SUB-ASSEMBLY

EXPLODED VIEW

ASSEMBLED VIEW

ELEVATION END ELEVATION

PARTS LIST

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>LEVER BASE PAD</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>LEVER BEND</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>LEVER EXTENSION</td>
</tr>
</tbody>
</table>
Supplementary Sheet 2 for use with Question 1(b)

LEVER BEND

Dimensions:
- View A: Lever Bend
- View B: Dimensions unspecified
- Dimension C: 150° ± 2’

Symbols:
- R1, R2, R5:
- Y:
- Page 03
Supplementary Sheet 3 for use with Question 2(b)(i)

NOZZLE 1

(Hidden detail of the internal fillet has been omitted for clarity.)

PLAN

ELEVATION

ALL DIMENSIONS IN MM

DESIGNER V. CLEANER

DRAWING NO 1

MATERIAL: POLYPROPYLENE

DATE 2016
NOZZLE 2

(Hidden detail of the internal fillet has been omitted for clarity.)

ISOMETRIC VIEW

PLAN

END ELEVATION

ELEVATION

ALL DIMENSIONS IN MM

DESIGNER: V. CLEANER

DRAWING NO. 1

MATERIAL: POLYPROPYLENE

DATE 2016