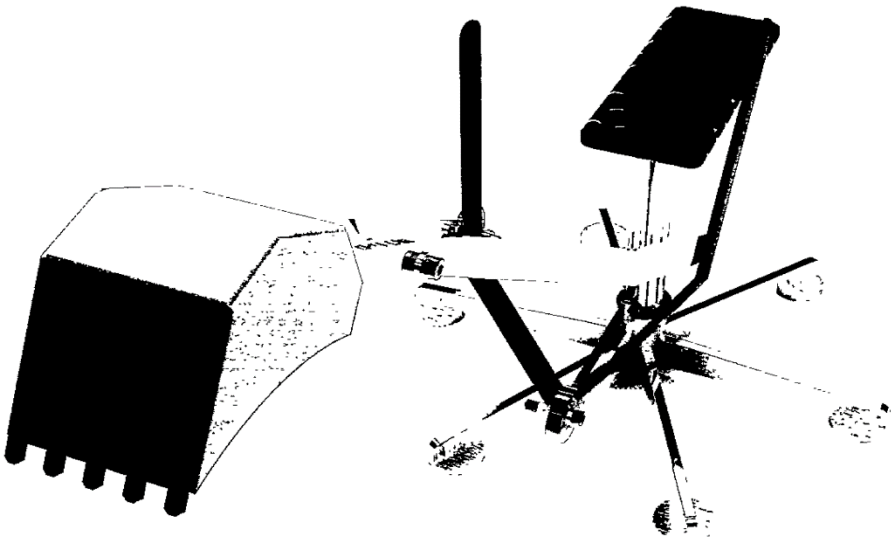
Candidate 1

Total marks — 80

Attempt ALL questions

DO NOT WRITE IN THIS MARGIN

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.**

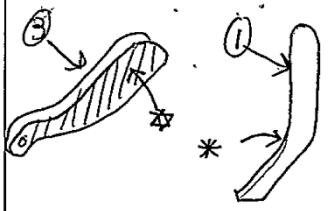
1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(a) Describe the 3D CAD constraints used to assemble the lever bend to the lever extension. You may use sketches to support your answer. 4

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

~~Constrain the visible surface~~



- Constrain the hatched surface of the lever extension to the non-visible surface of the lever bend.
- Create a point on the lever bend just above the ~~curve~~ point * and create a point on the lever extension at point ✡ and constrain these points.
- Using a perpendicular constraint set the long edge of the lever extension perpendicular to the long edge of the lever bend.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

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 Angled plan view. Provides info on the design from a different angle to the other views — 1

(ii) View B ~~Section~~ Full section Y-Y — 1
Provides information on the internal details of a component and the shape of the cross section.

(iii) Dimension C Angular dimension in degrees with a tolerance of ±2 minutes. Provides info on the angle the component ~~forms~~ is bent/manufactured to. — 1

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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 Used to store the technical graphics as shown on Supplementary Sheet 1. These would be updated with the redesigned components 1

(ii) .STL Used in CAM software and 3D printing. If the redesigned part is to be 3D printed or manufactured this file type would be used. 1

(iii) .3DS Used in 3D CAD software. The toy would be edited and redesigned in this format using 3D CAD software 1

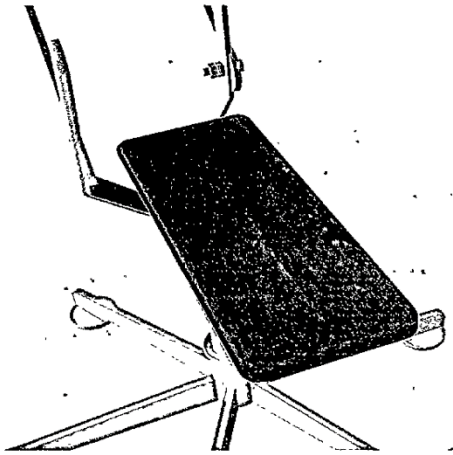
[Turn over

X7357701 05

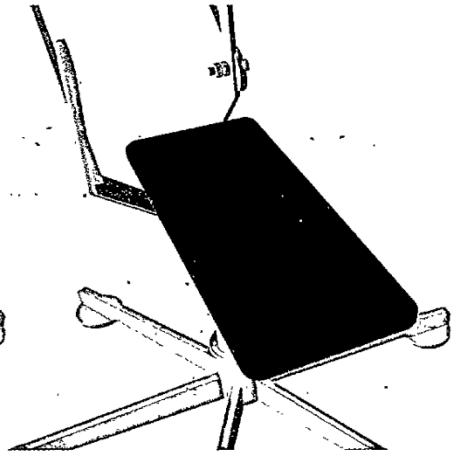
1. (continued)

DO NOT WRITE IN THIS MARGIN

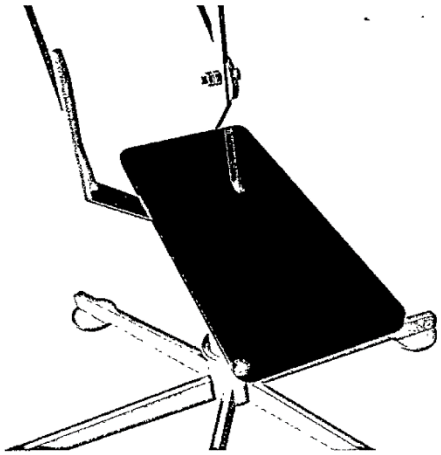
(d) A CAD illustration of the seat detail is produced. The stages of creating this detail are shown below. Stage 4 shows the final illustration.



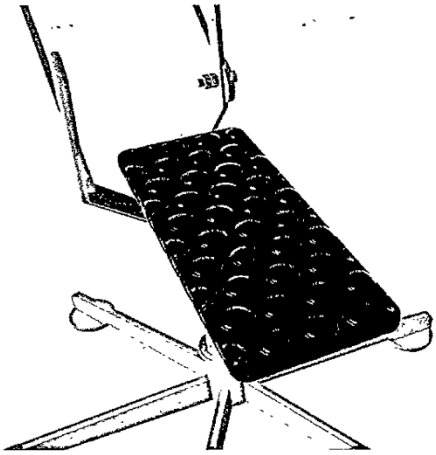
Stage 1



Stage 2



Stage 3



Stage 4

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1. (d) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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 — 1

Texture mapping. The 2D image of the red surface has been wrapped round the seat to give a realistic look.

(ii) Stage 2 to Stage 3 — 1

Reflections have been added. The light source will create reflections on certain parts of the seat and these have been added.

(iii) Stage 3 to Stage 4 — 1

Bump mapping has been used to adjust the brightness of each pixel to give the appearance of depth and ~~shad~~ to add shadows and reflections to create realism.

[Turn over

X7357701 07

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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. 1

.avi Audio Video Interleave

(ii) State the name of a **vector** file type that could be used to show a rendered image of the finished excavator toy. 1

Adobe Illustrator (.ai)

(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. 3

The colour space should be set to CMYK and not RGB.
The fonts should be in vector form
The images should all be of high quality (300dpi for printing
Crop marks & registration marks should be added.
Should be sent as a .pdf file to ensure the layout remains the same

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

It ~~is~~ recording ~~stimulating~~ real human motion so it is very realistic.

It allows very complex motion to be replicated in an animation. The animation can be in any environment.

It allows them to conduct analysis of the way the ~~vacuum~~ vacuum cleaner is used in real life. This could lead to improvements in ergonomics

The data recorded can be stored and used again in future animations with a different character or person moving around. The results can be compared with future tests to show improvements.

MARKS | DO NOT WRITE IN THIS MARGIN

2. (a) (continued)

(ii) Describe three **disadvantages** of motion capture technology to the manufacturer. 3

Large amounts of data are collected in a short space of time. This is time consuming to process and manipulate.
It requires expensive specialist software for post production and manipulation
The equipment required for recording the data is expensive and time consuming to set up.

[Turn over

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2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

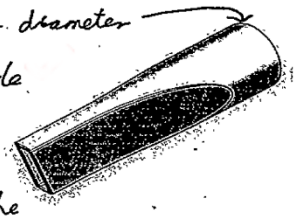
(b) After testing, the manufacturer wants to design a new nozzle. Two designs are being considered.

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.

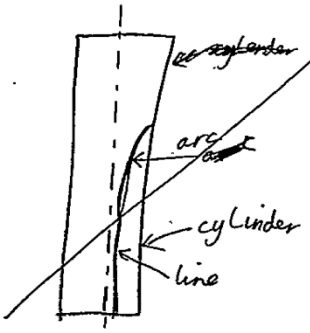
(i) Nozzle 1 — 5

1) Draw circle the size of the outer diameter



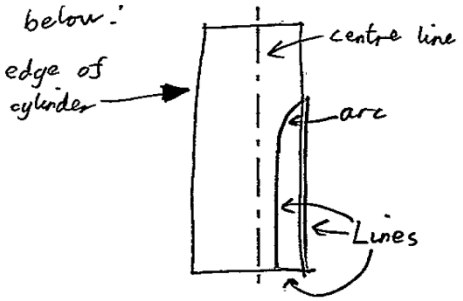
2) Extrude the full length of the nozzle

3) On a plane perpendicular to the first sketch draw the shape of the arc as shown below using the line and arc tools



4) Mirror the line and arc in the centre line

3) On a plane tangent to the surface of the cylinder, draw 3 lines & an arc as shown below:



4) Reflect sketch in centre line.

5) Extrude both sketches to remove material from sides of cylinder

6) Shell model to make it hollow

7) Draw inner circle with same centre as in step 1

8) Extrude inwards removing material by the thickness of the shell. Continued on P26

ADDITIONAL SPACE FOR ANSWERS

2bi) 9) Draw inner rectangle on nozzle end and extrude inwards by thickness of shell.

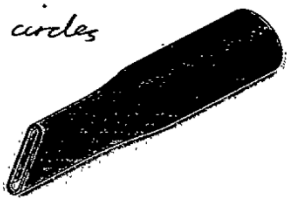
10) Create cutting plane on nozzle end to remove material. This creates the angled end.

11) Apply chamfers to all the internal & external edges except along the 2 circles.

2. (b) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(ii) Nozzle 2 4

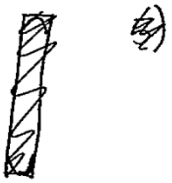


1) Using circle tool, draw 2 concentric circles to form the attachment end

2) Extrude the area between the circles by ≈55mm

3) Create plane offset from the extruded circles by ≈30mm

4) Sketch 2 rectangles then fillet the ~~edg~~ corners as shown below:



Fillets shown in purple

5) Loft the area between the circles to the area between the rectangles.

6) Extrude the area between the rectangles

7) Apply cutting plane on the end of the extruded rectangles.

8) Apply fillet to cut edges.

[Turn over

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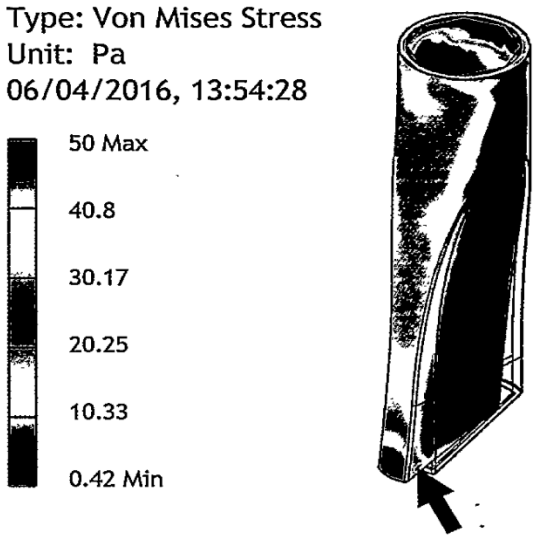
2. **(continued)**

MARKS | DO NOT WRITE IN THIS MARGIN

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.



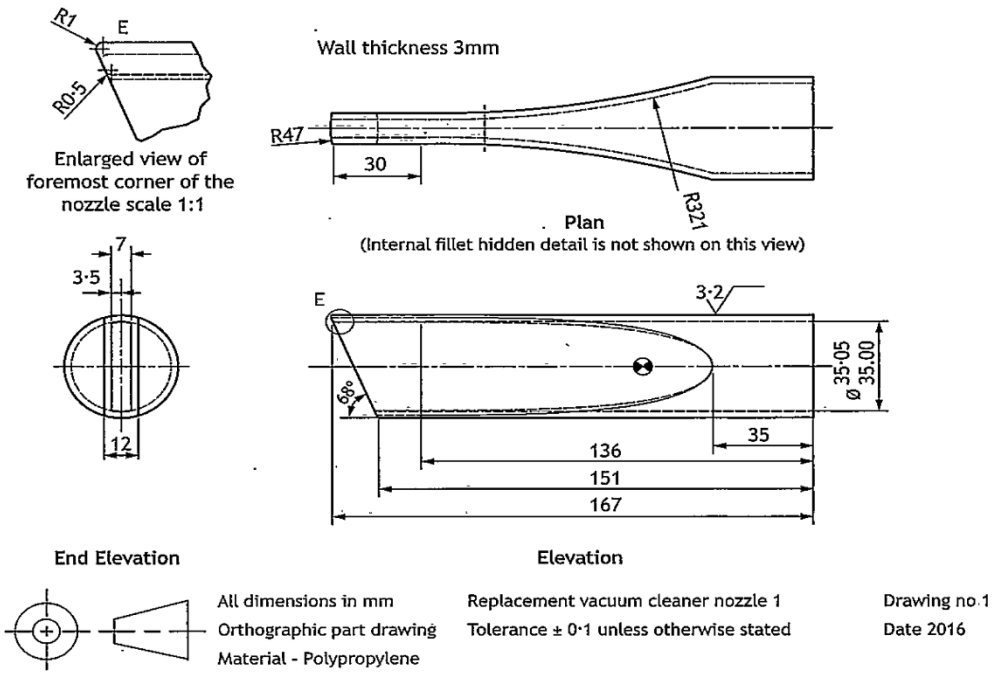
(c) Describe four set-up requirements that are necessary **before** the FEA simulation test can begin. 4

- The material and its specific properties must be defined
- The areas of the model that are fixed must be defined.
- The area/point where the force/forces are to be exerted must be defined.
- The magnitude and direction of the forces must be defined.
- The type of stress to be measured
- How the stress is to be displayed.

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

Dimensions - allow the part to be manufactured to size

Tolerances - specify the permissable variation in the size of the manufactured product. All tolerances are ±0·1 mm apart from the diameter which is between 35·05 mm and 35·00 mm.

Detail view E shows the ~~radius~~ radius of the fillets that would otherwise be missed out.

The wall thickness of 3mm shows how thick the material should be.

The material is specified so manufacturers can use the correct material

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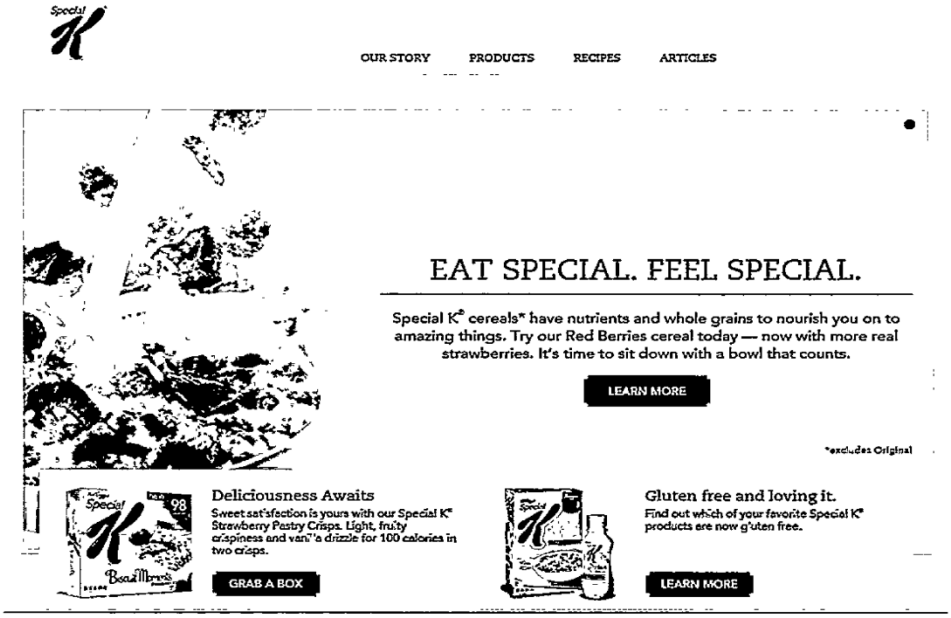
MARKS | DO NOT WRITE IN THIS MARGIN

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. 4

1 Line - The line under 'Eat Special' is used to emphasise the title and separate it from the text below. This line also links the image on the left to the text.

2 White Space - The middle section of the page has a lot of blank (plain coloured) space that emphasises the image and text & declutters the page

3 Colour is used to link the red in the cereal to the red title and 'learn more' icons. This connects the text to the image.

3. (a) (continued) MARKS | DO NOT WRITE IN THIS MARGIN

4 Texture - The photo of the cereal creates a lot of texture which adds depth and interest to the page.

(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 packaging for biscuits

Plastic packaging for individual cereal bars

Coated cardboard and foil yoghurt container with plastic lid

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

Screens such as on tablets use RGB colour space which can display colours differently to CMYK colours in print. Pantone Matching System can be used to ensure colour consistency across all media. Print examples include cardboard. The same fonts should be used to promote brand regognition. ~~across~~ The sizes of the logo and title should be kept the same relative to each other across all print and digital mediums. For example on the website and on the plastic packaging.

3. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

Describe four requirements of a camera-ready copy for commercial printing. 4

Fonts in vector format

Colour space set to CMYK

Images that are to bleed should extend 3-5mm past the crop marks.

Crop marks and registration marks should be added.

The camera ready copy ~~se~~ should be the final design of the document.

Colour calibration marks should be added.

(d) State a suitable printing process to mass produce the cardboard biscuit packaging. 1

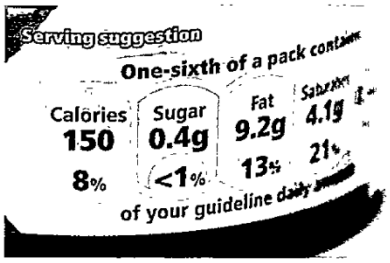
Commercial laser printing

3. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

Two examples are shown below.



Label 1

Label 2

Explain, with reference to the labels shown above, how graphic techniques have been used to make the nutritional information as clear as possible. 4

Label 1: Contrast has been created between the sections using colour. This clearly separates every catagory.

Label 2: Colour has been used to make the nutrition info stand out by making the background darker than the boxes with info.

Both: The ~~text~~ numbers inside the boxes are larger than the text ~~make~~ emphasising them.

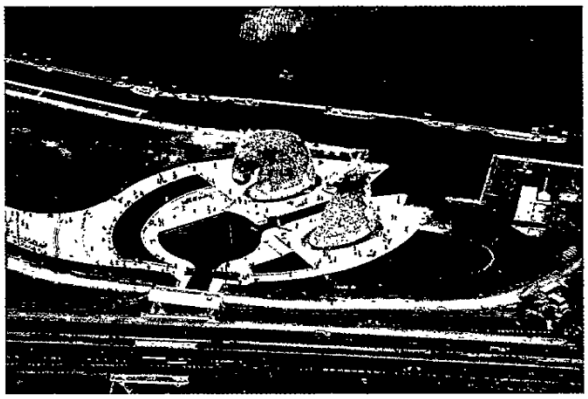
The repetition of the shape ⬡ with a white border helps inform the reader that similar info is contained in each box.

The layout of the boxes with a title, ~~number~~ the number of grams and the percentage is consistent between products making it easy for customers to interpret.

Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

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



Aerial photograph of the Kelpies and the visitor's map of the Helix Park

(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. 6

Survey 1 Topographical Survey

Purpose To show the shape of the land and the locations of water ~~etc~~ & trees etc. Used to ensure the statues can be seen and that they fit in with their surroundings. Also used to inform the construction of foundations if the ground is sloped.

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4. (a) (continued)

DO NOT WRITE IN THIS MARGIN

Survey 2 Drainage Survey

Purpose To check that the planned ~~location~~ location is not a flood plane and to find out the depth of the water table. To ensure the suitability of the location for the proposed development.

Survey 3 Underground Survey

Purpose To show the geological makeup of the land. For example ~~where the~~ ~~we~~ the type of rock and soil and the depth of bedrock. This informs the construction of foundations to ensure structural strength & safety. Also shows underground pipes to ensure they are not damaged.

4. **(continued)**

MARKS | DO NOT WRITE IN THIS MARGIN

(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 2

To export as an .stl file for use with rapid manufacturing technology or 3D printing. To extract drawings and dimensions to enable them to create other models to scale.

(ii) structural engineer 2

To conduct digital tests such as Finite Element Analysis to ensure safety and structural strength. To analyse the number and size of load bearing walls. To determine the best materials to use based on the design & intended use.

(iii) construction trades 2

To inform them of dimensions and tolerances To inform them of the materials to be used in construction. To see how the building is to be assembled. To see what the exterior render/finished building should look like.

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

- Targeted advertising can show only people who are in the target audience ~~the~~ advertising.
- Interactive graphics such as VRML models & videos can be used to engage viewers and provide them with more information.
- Links to websites or online content can be shared between freinds quickly and easily
- Enabling consumers to find out information on any device from any location through a website
- Up to date information can be shared instantly with consumers

5. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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.

1 →

(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 3

The web page is layed out in rows which helps link related hyperlinks or content together. The repetition of shape (1) shows that the content is related. ~~and that once~~ Once the viewer realises that one box is a hyperlink, it is clear the others are as well. The contrasting colours of the boxes shows that although related, the content is not the same.

5. (b) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(ii) User interface 3

The use of arrows in the header bar makes it clear there is more content that can be accessed by clicking on the arrow The use of (c ~~three~~ identically shaped boxes at (1) provides another method of accessing the sites content. This is more graphic and images are provided to help understanding. The clear boxes in the 'Dietary Resource Console' gives direct access to 3 parts of the website

(iii) Graphic media file formats 3

The website is made informative through use of images, probably in JPEG form. These are high quality files but feature compression to reduce file sizes and thus load times. The ~~graphics~~ graphics help to make the website more intuative intuative to use because it provides an ~~additio~~ additional source of information to the text.

Text, ~~and~~ shapes and colour will be in HTML format. They provide information ~~and~~ HTML also enables hyperlinks which make navigation easy

[END OF QUESTION PAPER]

X7357701255

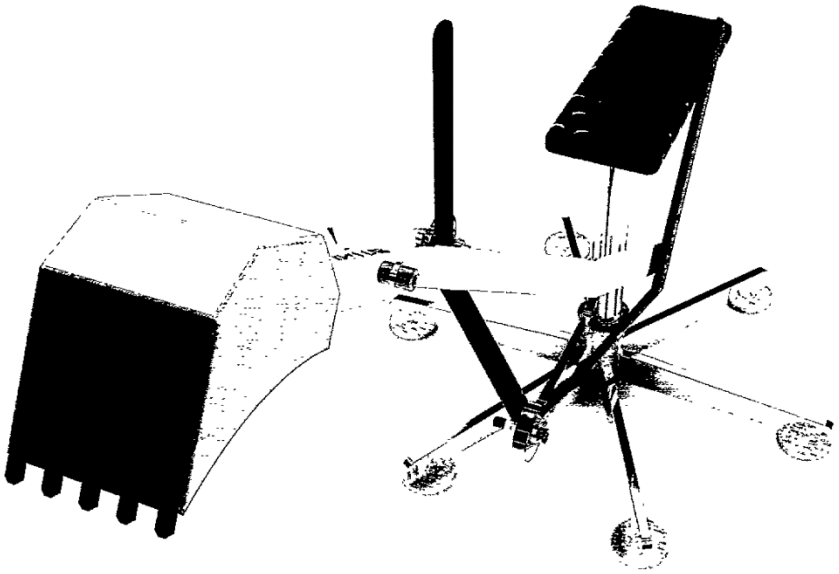
Candidate 2

Total marks — 80

Attempt ALL questions

DO NOT WRITE IN THIS MARGIN

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.**

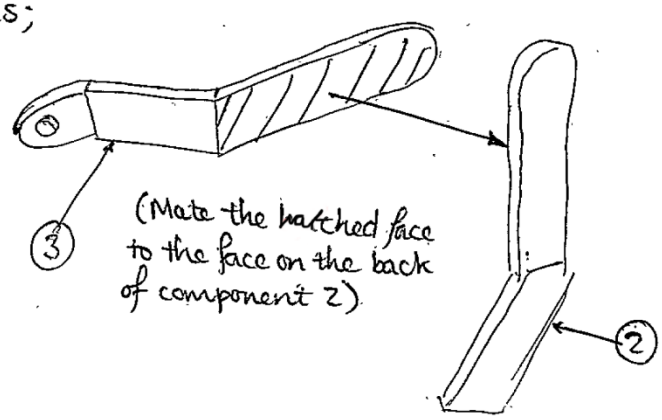
1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

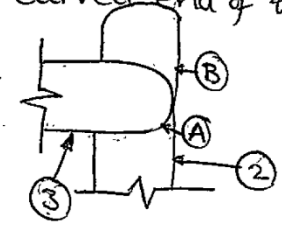
(a) Describe the 3D CAD constraints used to assemble the lever bend to the lever extension. You may use sketches to support your answer. 4

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

- Use a mate constraint to join the following faces;

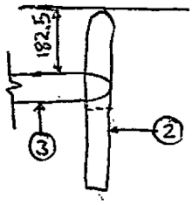


- Use a tangent constraint so that the straight edge of the 'lever bend' is tangent to the curved end of the 'lever extension'



~~(The curve A is~~
(The edge B is tangent to curve A)

- Generate a plane at the top of the lever bend oriented as shown below and mate the upper edge to the bottom of this plane offset downwards by 182.5mm. The plane should be parallel to the top face of the 'lever extension'.



[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

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 Auxilluary View conveys the true shape of features so that the manufacturer can determine the actual shape of a component with bends where orthographic projections do not show this 1

(ii) View B Sectional View shows the manufacturer the thickness of the material used. 1

(iii) Dimension C Angle with Symetric Tollerance shows the manufacturer the angle which is to be achieved between the two edges and how accurately the angle must be achieved, in this case it must be within 2° of 150°. It shows the manufacturer the level of accuracy required so should advise them as to which methods of manufacture to use. 1

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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 Native AutoDesk filetype for technical drawings, contains dimensional drawings. The dimensions could be edited to redesign seat. Provides the projection of the original design. 1

(ii) .STL Contains information about the triangulated faces of the model. Morphing the 3D design in this file could help edit the seat. Can be used to get a 3D model of the original design like a mesh. 1

(iii) .3DS Contains a 3D representation of the original design. Could be used to assess shortfalls of the original design to help plan improvements. 1

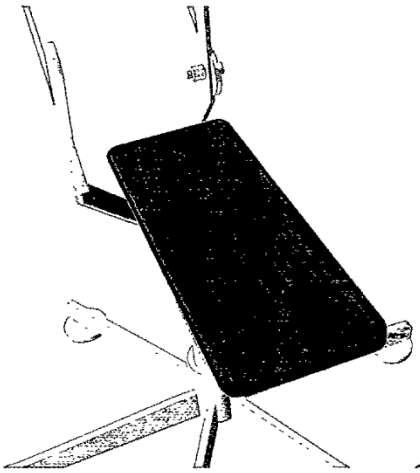
[Turn over

X7357701 05

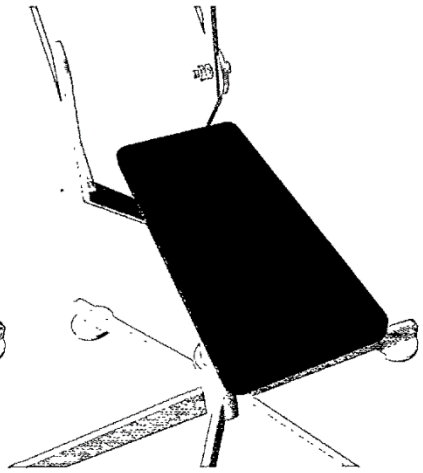
1. (continued)

DO NOT WRITE IN THIS MARGIN

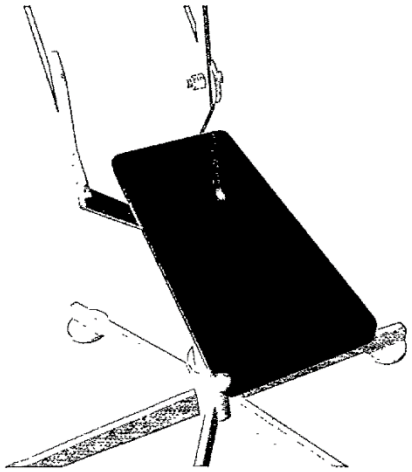
(d) A CAD illustration of the seat detail is produced. The stages of creating this detail are shown below. Stage 4 shows the final illustration.



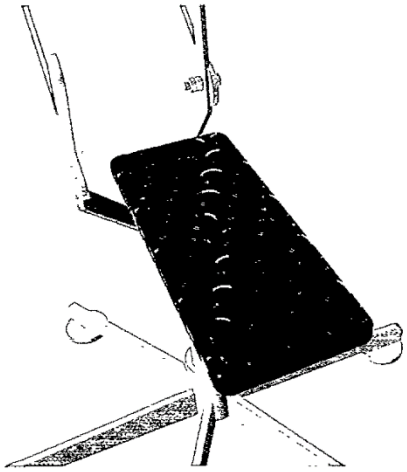
Stage 1



Stage 2



Stage 3



Stage 4

X735770106

1. (d) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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 — 1

Texture mapping has been used to replace the wooden texture with a solid red texture (like wrapping red wallpaper round the object)

(ii) Stage 2 to Stage 3 — 1

Specularity has been added to the seat so that it shows reflections (high specularity, clearer reflections)

(iii) Stage 3 to Stage 4 — 1

Bump mapping has been used to create the impression of surface which is not perfectly flat, this is done using mathematical algorithms to adjust the lighting on each pixel creating the effect of an uneven surface without increasing polygon count.

[Turn over

X7357701 07

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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. 1

.wmv

(ii) State the name of a **vector** file type that could be used to show a rendered image of the finished excavator toy. 1

~~.pdf~~ .ai (Adobe Illustrator)

(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. 3

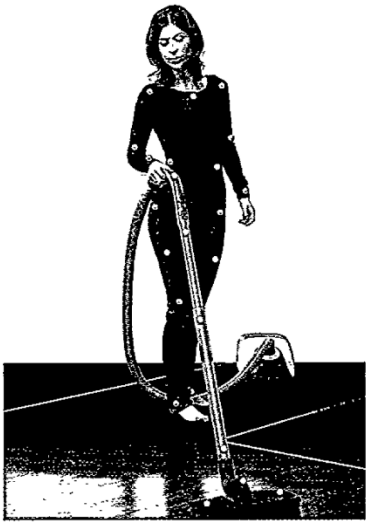
They need to consider weather it is camera ready. To ensure edge to edge & printing anything that is to reach the edge of the page should bleed over by 3mm. All fonts should be provided to the printer or converted into vector images if they are used. All images should either be vector images or if they are raster be 300dpi (dots per inch) or more. Crop marks should be on the page so the print technician knows where to trim post-print as should registration marks to allign the plates of the printer.

X7357701 08

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

It can very accurately track the movement of a person or object. It can be used to apply a texture over a person (texture mapping) as is done in the video games industry allowing the appearance of the person or product to be later edited for promotional use. It helps show how the person and the product interact so can help analyse the ergonomics of the product informing design alterations.

This data can be saved and later analysed.

MARKS | DO NOT WRITE IN THIS MARGIN

2. (a) (continued)

(ii) Describe three **disadvantages** of motion capture technology to the manufacturer. 3

It requires very expensive equipment and software so is propably not the most cost effective option. It requires the physical product to be produced whereas computerised testing does not. Not all people interact with the product the same way (for example, different sized hands), this means lots of different people would have to be brought in to test it thouroughly.

[Turn over

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

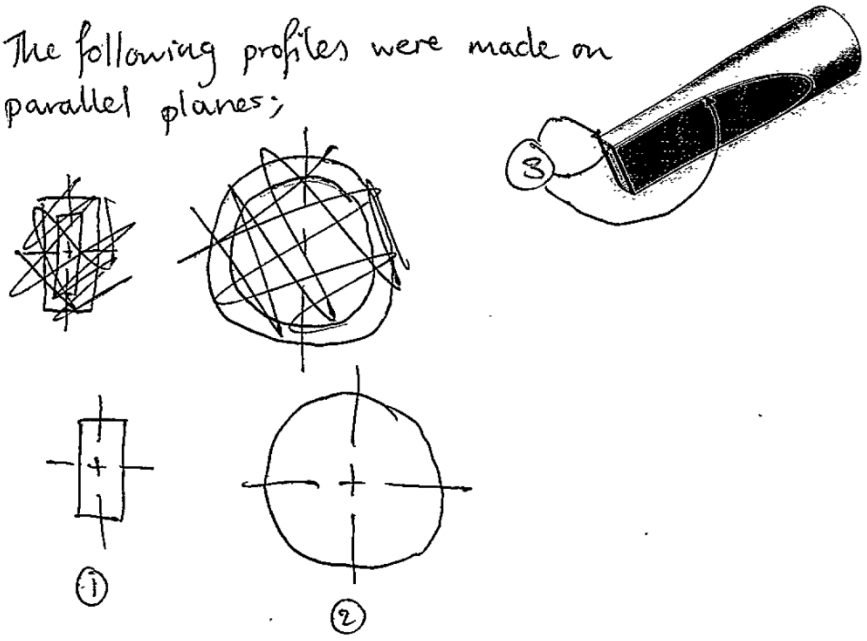
(b) After testing, the manufacturer wants to design a new nozzle. Two designs are being considered.

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 — 5

The following profiles were made on parallel planes;



Loft was used to join them.

The design was then shelled using the shell command removing the flat faces at either end:

Fillets were then applied the the edges shown in ③.

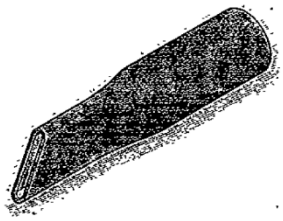
A chamfer was applied to the front to get the angular finish on front of nozzle.

Azeta

2. (b) (continued)

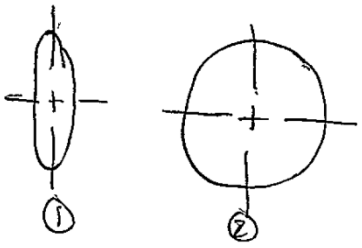
MARKS | DO NOT WRITE IN THIS MARGIN

(ii) Nozzle 2 4



~~Create 2 planes~~

Create 2 planes (parallel)
Sketch the following on each plane respectively.



Loft them together then apply an extrusion to each flat faced end of the model. Then shell the model removing the two flat faces.
Use a chamfer to get the angle on the front of the nozzle.

~~Use fillets or morphing~~

Use morphing to achieve the smooth finish removing all harsh edges on the body of the ~~m~~ nozzle.
Fillet the ~~inside~~ edges of the front of the nozzle.

[Turn over

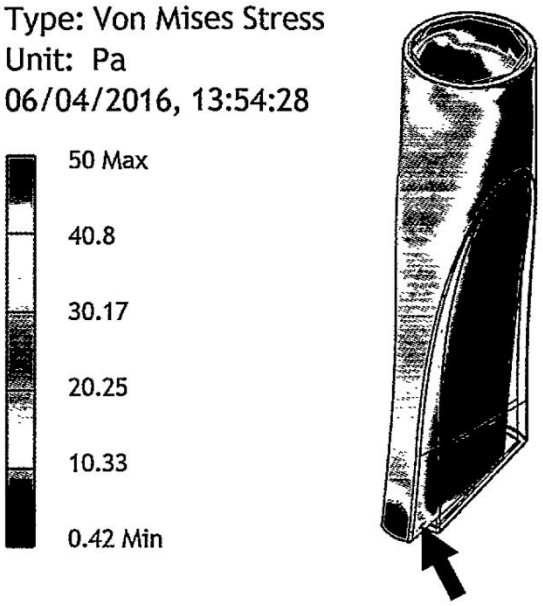
X7357701135

2. **(continued)**

MARKS | DO NOT WRITE IN THIS MARGIN

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.



(c) Describe four set-up requirements that are necessary **before** the FEA simulation test can begin. 4

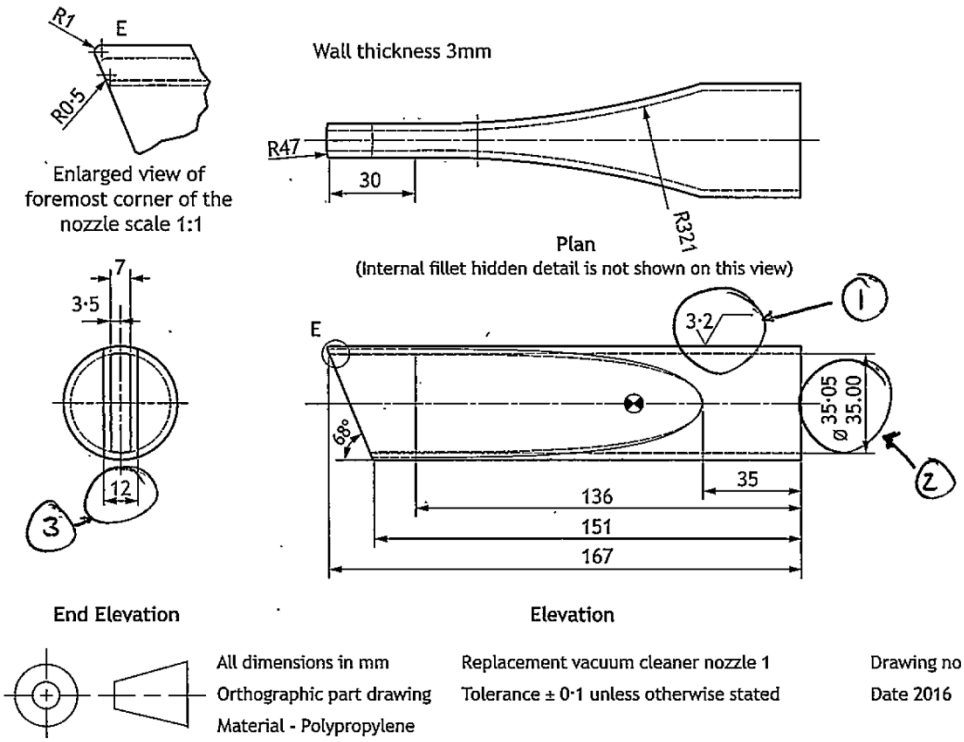
The model must be produced and all materials used must be defined. The software must be told what if mapping (i.e. displacement, Von Mises Stress etc.). A force or pressure must be selected and applied to an area of the design.

X7357701144

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

(1) Information about the texture of the suface given by (3.2√) shows the finish that is required to be applied to the face.

(2) Functional tollerence shows the degree of accuracy required at parts of the design would result in a more accurate machine being used in the CAD CAM process.

(3) Dimensions allow the machines that are producing the component the sizes they must adhere to so the product is the right scale & functions as intended.

X7357701154

MARKS | DO NOT WRITE IN THIS MARGIN

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. 4

1 Unity has been achieved by repeating the colour red throughout the page, helps create brand identity + guides eye through page.

2 Line has been used to act as a visual bridge between the headline + body text below it to guide the eye down the page from headline to body text.

3 Repetition has been used (the shape of the 'learn more' boxes is repeated) this unifys the page and helps the user identify the buttons on the page they can interact with.

3. (a) (continued) MARKS | DO NOT WRITE IN THIS MARGIN

4 White space has been used at the top of the page to direct the eye down the page to the focal point – the large image + headline. It also prevents a cluttered design and makes it easier to read.

(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 packaging for biscuits

Plastic packaging for individual cereal bars

Coated cardboard and foil yoghurt container with plastic lid

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

Their website will be shown on monitors using RGB colourspace which may not exactly match the colours on the ~~card~~ product packaging (i.e. red on website may not match red on biscuit package) as printing ~~used~~ uses CYMK colourspace. Different printing techniques may be needed to print on cardboard for biscuit package than plastic for cereal bars (i.e. offset lithography for cardbord + flexography for plastic.). The description of the biscuits on the packaging should match their description on the website to avoid false advertising. Pantone matching system should be used to get an exact colour match for the red on the biscuit, cereal bar & yogurt containers.

X7357701 17

3. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

Describe four requirements of a camera-ready copy for commercial printing. 4

The filetype should be appropriate for commercial printing (i.e pdf). To ensure edge to edge printing there should be a 3mm bleed off the edge of the area. Crop marks should be applied so the printers know where to trim the paper post-print. Registration marks should be shown to allign the plates of the printer. All fonts should be provided to the printer or converted to vector images. All images should be vector or if raster should be at least 300dpi (dots per inch).

(d) State a suitable printing process to mass produce the cardboard biscuit packaging. 1

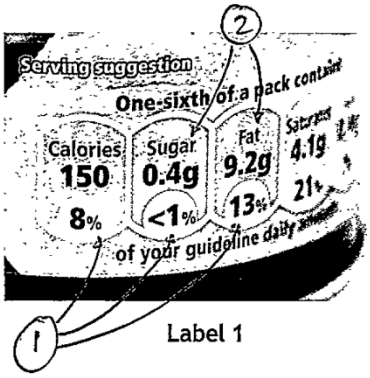
~~Offset Lithography~~ Offset Lithography

3. (continued)

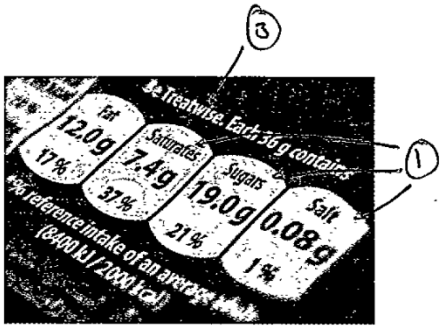
MARKS | DO NOT WRITE IN THIS MARGIN

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

Two examples are shown below.



Label 1



Label 2

Explain, with reference to the labels shown above, how graphic techniques have been used to make the nutritional information as clear as possible. 4

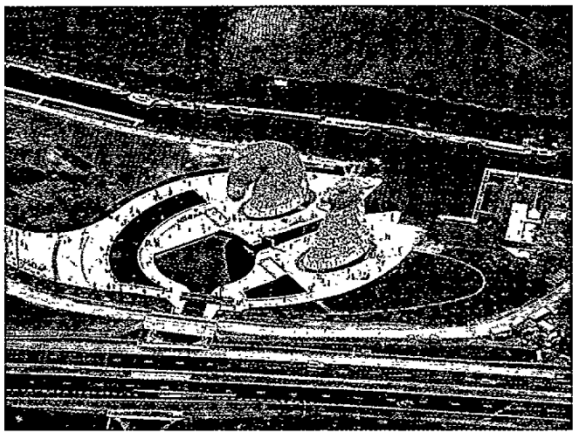
(1) Repetition has been used in both labels 1 & 2, the shape containing each value is the same in their respective designs so readers understand it is related. Label 1 uses colour to (2) draw the readers attention to the nutritional information, It helps the text stand out as the background behind it is consistant. Could be a colour coding system so the reader can quickly identify if the food is healthy (i.e. red is bad, green is good). ~~Label Design 2 used~~

(3) Label 2 uses reverse to that the nutritional data stands out and is able to be quickly read against the ~~dark~~ dark background without straining the eyes.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

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



Aerial photograph of the Kelpies and the visitor's map of the Helix Park

(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. 6

Survey 1 Topographical Survey

Purpose Shows contours and drainage to help plan to prevent flooding or water build up. Identifies existing features which may need to be removed or worked around during construction. Shows the area of land that the construction must be within. Shows existing ~~reds~~ roads so that the park can be built in an accessible location.

4. (continued) MARKS | DO NOT WRITE IN THIS MARGIN

(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 2

They could use 3D printing technologies to produce a physical model which could be tested to identify weaknesses and shortcomings of the design. They could use the physical model to see how the material affected the durability of the design.

Could ajust the model (using morphing) to make it look better or do adjustments on the advice of the other proffessionals present.

(ii) structural engineer 2

They could use FEA (finite element analysis) to see how the 3D model would react to different forces that would act on it when constructed (i.e. high winds). They could use the model to identify which materials would be suitable to support the design.

Could consider the aerodynamic and how wind would affect the model using CFD (computational fluid dynamics)

(iii) construction trades 2

They could use the model to work out how it would be built from the ground up like where they would need scafolding and which parts would need assembled on-site. Would let them see how different parts of the design fit together and how they would attach them during construction.

X7357701228

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

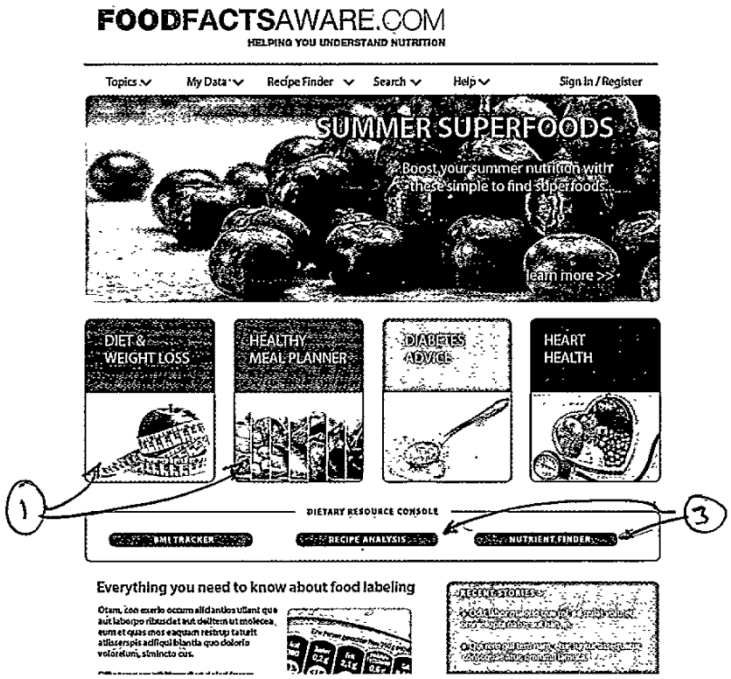
- Producing a website can draw in people searching the internet (reaching a different audience to paper media/old media), a website is accesible 24/7 making it easier for consumers to view and learn about a product.
- Interactive screens can be used to engage the consumer as it creates a more hands on feel allowing the consumer to decide how they explore the product; this makes the product more appealing.
- They could use videos (.wav) or 3D virtual reality experiences (VRML) to show off the product. A video can convey a lot of information very fast compared to text and is generally more interesting. Using VR allows the viewer to interact with the product ~~an~~ in a virtual world creating excitement about the product.

High quality graphic communications will create a good impression with the audience.

5. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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 3

White space has been used to make the layout clear, uncluttered and easy to use. ~~By using harmonising colours the page~~ The page's symetric ballance draws the eye down the centre of the page enabling them to see almost all the information. The use of large images helps break up the text and conveys the theme visually.

X7357701 24

5. (b) (continued) MARKS | DO NOT WRITE IN THIS MARGIN

(ii) User interface 3

Large buttons with images (ie. 'Diet & Weight loss') draw the reader to them. The use of different colours for them makes it clear they can be clicked/interacted with. The arrows indicate the drop down menus so it is clear that they can be selected. The use of the same repeated shape for buttons ③ on the 'dietary food console' help to convey they can be selected and are seperated by white space so the reader knows they're distinct. This all makes it easy to use.

(iii) Graphic media file formats 3

Lots of images are on the page, they are large and clear so likely vector images with a .ai (Adobe Illustrator) filetype (or similar). The interviews with proffessionals will be videos most likely so ~~.wav files can~~ .wmv files can be used to convey the information. The annotated photographs could be .png as this (portable network graphic) is a widely accessible filetype requiring little software to open. Printable fact sheets may be .pdf as this is a universally recognised easy to open filetype.

[END OF QUESTION PAPER]

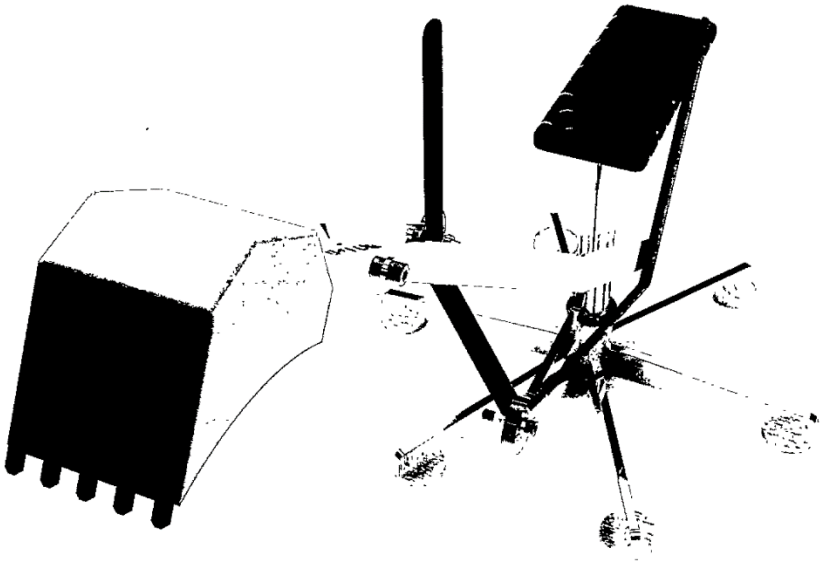
Candidate 3

Total marks — 80

Attempt ALL questions

DO NOT WRITE IN THIS MARGIN

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.

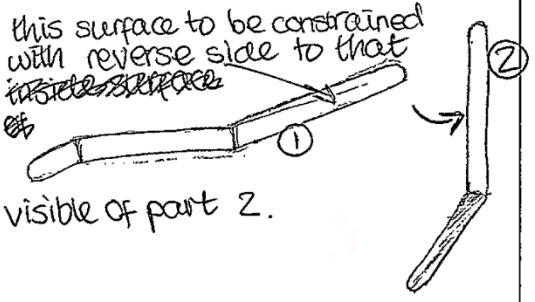
Drawings generated from the model are shown on the **Supplementary Sheets 1 and 2 for use with Question 1.**

1. **(continued)**

MARKS | DO NOT WRITE IN THIS MARGIN

(a) Describe the 3D CAD constraints used to assemble the lever bend to the lever extension. You may use sketches to support your answer. 4

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



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X7357701 03

MARKS | DO NOT WRITE IN THIS MARGIN

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 isometric view to give the manufacturer an visualisation of the part 1

(ii) View B angle, with tolerance, informing the manufacturer of the angle to bend the lever as well as stating the tolerance to allow for 1

(iii) Dimension C section view, to allow manufacturer to see any internal detail that may not otherwise be visible. 1

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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 used for the working document, while it is still in the process of being designed — 1

(ii) .STL used for use with digital prototyping, allowing designer to test product prior to being manufactured — 1

(iii) .3DS used to show client, other members of the design team a 3 Dimensional image/view of the part — 1

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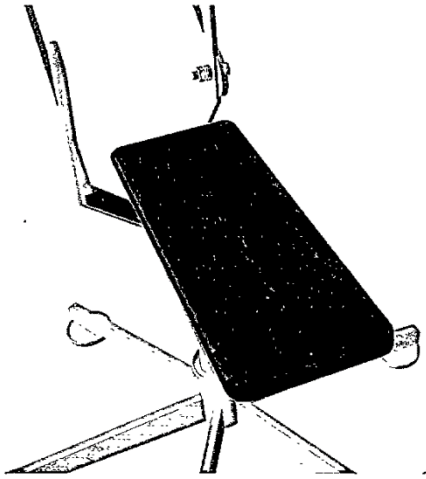
X7357701 05

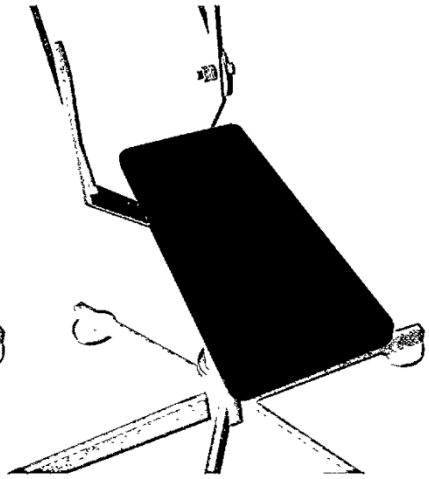
1. (continued)

DO NOT WRITE IN THIS MARGIN

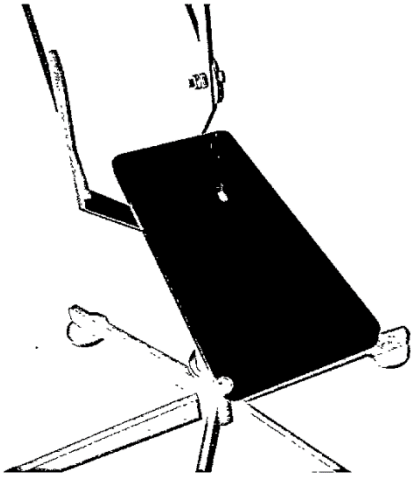
(d) A CAD illustration of the seat detail is produced. The stages of creating this detail are shown below. Stage 4 shows the final illustration.



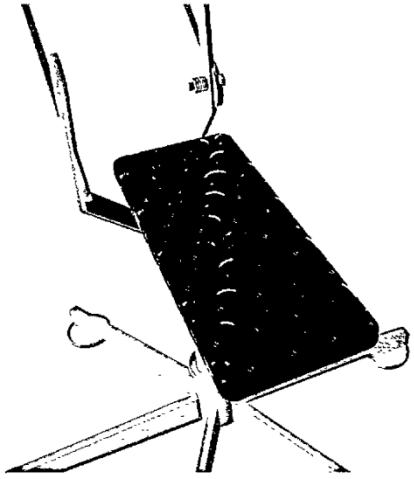
Stage 1



Stage 2



Stage 3



Stage 4

1. (d) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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 — 1

change of material, from wood to plastic, maybe following tests revealing unsuitability of wood surface.

(ii) Stage 2 to Stage 3 — 1

Surface mapping - adds reflection to surface creating a more realistic model, and suggests it is in a lit environment.

(iii) Stage 3 to Stage 4 — 1

Bump-mapping to create impression of 3D surface, featuring texture, shown by the use of white pixel highlights along the edge of lines, all coming from particular, same direction.
Adding this ~~surface adds~~ ~~step~~ surface & feature to the [Turn over
grips to the seat, improving safety of the toy.

X7357701 07

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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. 1

Quicktime video file for use on ~~mac~~ mac computers

(ii) State the name of a **vector** file type that could be used to show a rendered image of the finished excavator toy. 1

Bitmap

(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. 3

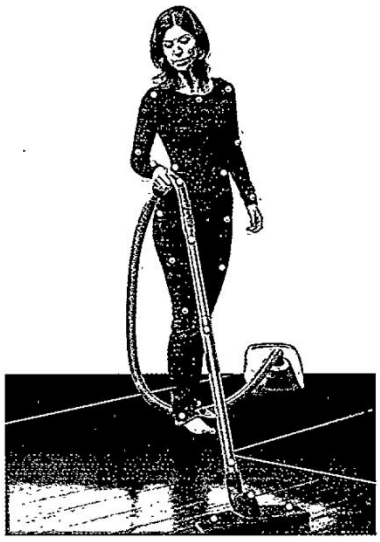
the designer would have to consider, the printing process that is to be used, as this will determine whether they will need to include features such as bleed, registration & crop ~~mark~~ marks etc. As it is a poster, it is likely to be printed ~~on~~ using offset lithography, this will therefore need to be printed on OS paper, the designer will have to consider this when creating the document upon start up.

X7357701 08

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

- motion capture technology creates highly accurate animations.
- Modern technology allows the creation of motion capture, without the use of suits, this is therefore quicker as well as produces even more accurate
- it allows the manufacturer to accurately see where the product works & does not work well. show

2. (a) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(ii) Describe three **disadvantages** of motion capture technology to the manufacturer. 3

- traditional methods that use suits are time consuming & expensive to set up.
- it does not give as good an indication of how a product will perform under pressure as Finite Element Analysis (FEA), which specifically indicates areas of strengths weaknesses

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X7357701111

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

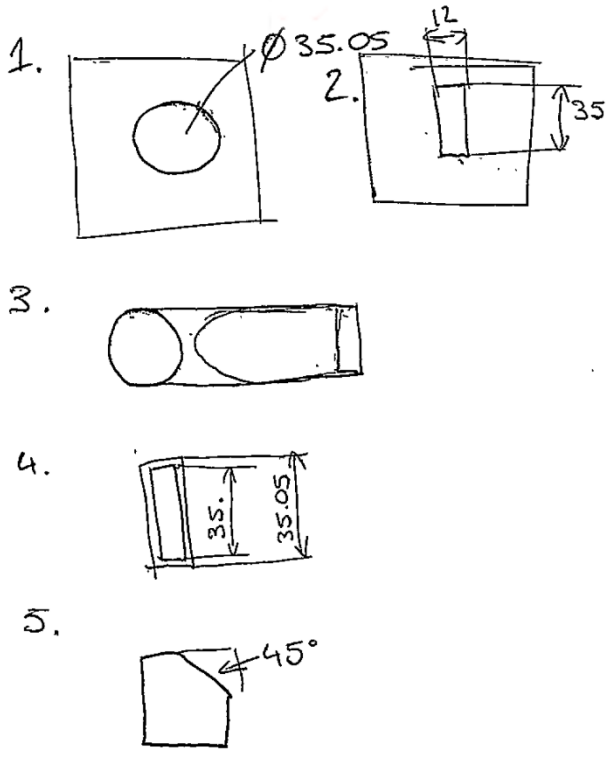
(b) After testing, the manufacturer wants to design a new nozzle. Two designs are being considered.

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 — 5

1. create 2D sketch of circle on surface plane 1.
2. create 2D sketch of rectangle on surface plane 2 -at 68°
3. loft between the two surfaces.
4. shell object completely with .025 walls.
5. ~~fillet~~ edges chamfer



2. (b) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(ii) Nozzle 2

4

1. create 2D sketch of circle on surface plane 1.
2. create 2D sketch of oval on surface plane 2.
3. loft between the two surfaces
4. shell object completely with .025 walls.
5. ~~chamfer~~ fillet edges.

5. 

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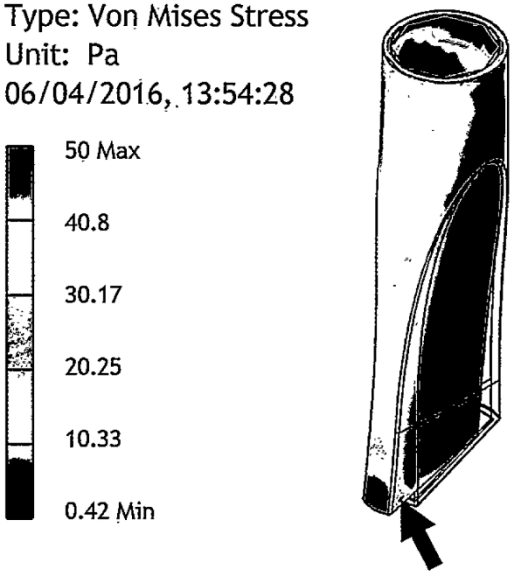
X7357701 13

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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.



(c) Describe four set-up requirements that are necessary **before** the FEA simulation test can begin. 4

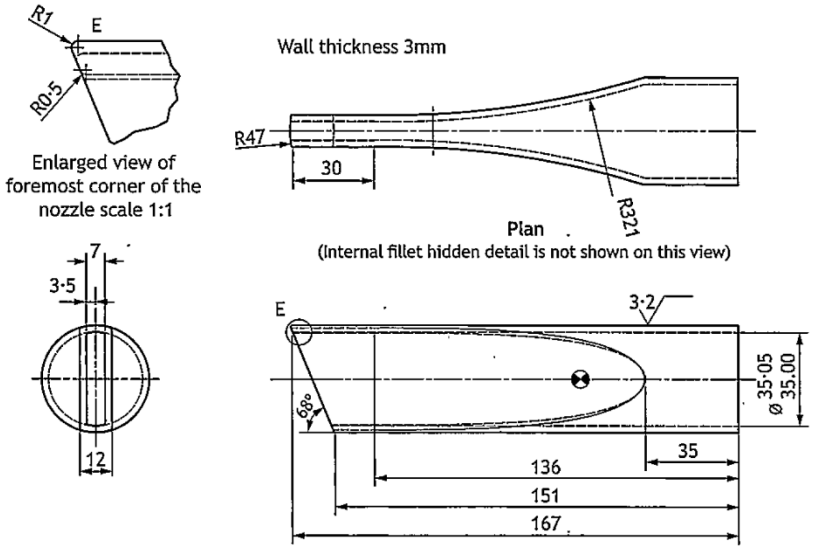
- material has to be established & allocated to part
- all dimensions must be accurate
- location of pressure to be chosen & established
- force of pressure to be established
- all to allow for fair & equal testing.

X7357701144

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

- material stated as polypropylene informs manufacturer of material necessary.
- radii of fillets are stated informing manufacturer how much the edge surfaces are to be filleted.
- widths of rectangular end of nozzel are stated, informing manufacturer of wall depth to be left following shell - same too, with circular opposite end.

MARKS | DO NOT WRITE IN THIS MARGIN

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. 4

1 line - the simple use of the red line under the slogan effectively draws the eye across the page. the outline of the two large boxes also creates depth within the page.

2 unity - there is much unity within the page, shown primarily through use of colour, the same red colour/ tone has been used across the page, in the text boxes, titles, logo & within the main image.

3 drop-shadow - used ~~for~~ with images, logo & line at top of page, this adds depth to the page, creating an interesting & appealing design.

3. (a) (continued) MARKS | DO NOT WRITE IN THIS MARGIN

4 alignment- at the bottom of the page the text has been left aligned, along with the red text boxes, this creates a well structured design & is smart. the text is also neatly aligned to the edge of the image with both columns having equal margins.

(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 packaging for biscuits

Plastic packaging for individual cereal bars

Coated cardboard and foil yoghurt container with plastic lid

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

- Digital media uses the additive colour group RGB, whereas the printed media uses the subtractive colour group CMYK.
- Digital screens often appear brighter (more vibrant) and more blue-ish in hue than printed media.
- To avoid this difference designers can colour calibrate the printer & digital monitor/computer.

3. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

Describe four requirements of a camera-ready copy for commercial printing. 4

- It must feature a full bleed to allow for content to be reach all edges after cropping.
- for offset printing, registration marks are necessary to ensure each colour layer (C,M,Y & K) are printed exactly on top of each other
- crop marks must feature, to inform where the document is to be cropped following printing
- The size of OS paper must be established
- colour match boxes should also be present

(d) State a suitable printing process to mass produce the cardboard biscuit packaging. 1

offset lithography printing

X7357701 18

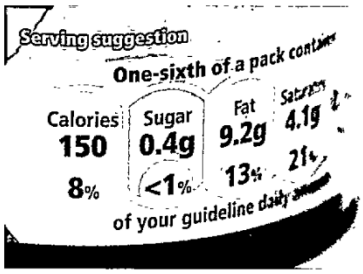
Page 18

3. (continued)

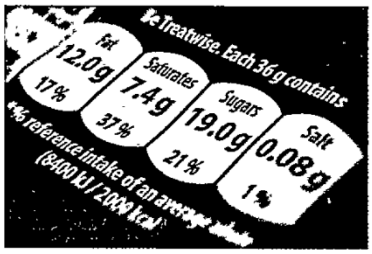
MARKS | DO NOT WRITE IN THIS MARGIN

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

Two examples are shown below.



Label 1



Label 2

Explain, with reference to the labels shown above, how graphic techniques have been used to make the nutritional information as clear as possible. 4

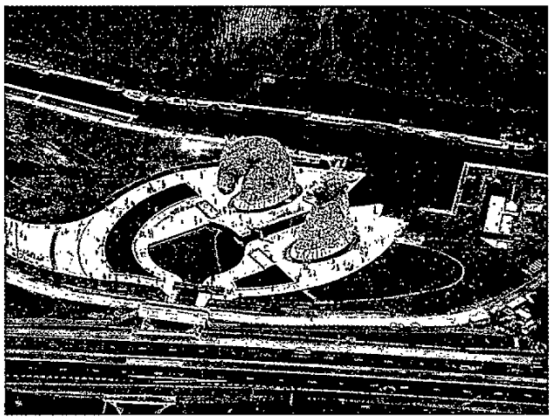
- white outlines have been used in both labels, around the individual boxes - this clearly separates the information from the image behind
- bold font has also been used in both labels, this displays dominance & importance for the information/text that is bold, - suggesting that the quantities & percentages are important for the consumer to know
- in label one, different colours have been used for each box, this differentiates each value/number, and gives it its own importance.
- in label two, a transparent version of the text colour has been used as the background for each box, this creates unity ~~between~~ between the boxes, as well as with the text.

[Turn over

X7357701 19

MARKS | DO NOT WRITE IN THIS MARGIN

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



Aerial photograph of the Kelpies and the visitor's map of the Helix Park

(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. 6

Survey 1 underground survey

Purpose to establish where existing pipes, water works exist.

X7357701 20

4. (a) (continued)

DO NOT WRITE IN THIS MARGIN

Survey 2 _____

Purpose _____

Survey 3 _____

Purpose _____

X7357701 21

[Turn over

4. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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 2

· gather information of the dimensions, which they would then scale down to produce their model.

(ii) structural engineer 2

· use 3D model along with FEA to ensure the sculptures are structually sound & safe to build.

(iii) construction trades 2

· take information on the materials needed to go to suppliers to buy materials ready for construction.

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

* design & create a website benefits include:
- being able to view more than one page at a time by having multiple windows of tabs open.
- the ability to easily produce a website that can be presented in different languages.
- websites can be viewed all over the world, allowing advertisers to attract a large audience.

* interactive digital media is a great way for advertisers to appeal to customers as:
- it instantly creates a physical relationship between customer & company.
- makes the customer feel involved & part of the activity/company.

* tv adverts are a popular way to appeal to consumers as they are an easy way to reach out to a large audience and can be even a short video.

5. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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 3

- the page has a grid structure, this means all the information is presented clearly & orderly.
- the colourful boxes in the centre of the page have equal spacing & margins within & between each.
- all text has been aligned neatly, for example the subheadings is aligned right, to the end of the heading text. ~~the bottom of the page has been~~

5. (b) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(ii) User interface 3

- the use of drop down menus is a clear & simple way of allowing the user to understand & see where they can reach further information
- use of sophisticated colour scheme gives smart & professional overall appearance, giving good impression to user.
- much white space is present giving a clear impression & makes the page easy on the eye for the user
- each section has been clearly identified & seperated allowing ease of use for user.

(iii) Graphic media file formats 3

- the use of a variety of media file formats adds depth to the content of the website.
- having video interviews means the user can watch & listen to information instead of reading
- having printable fact sheets allows users to physically interact with the information as they please in a physical way
- use of annotated photographs creates a clear & visual way of reading information.

All of these help make the website user-friendly as well as informative.

[END OF QUESTION PAPER]

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MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

5b.i. the text in the middle of the page, over the image has been aligned right, this draws the eye across the screen to the right side.

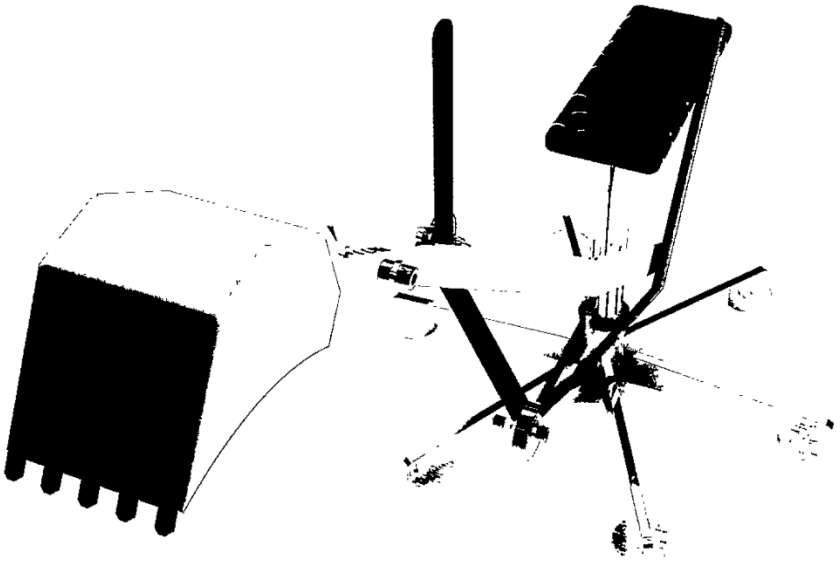
Candidate 4

Total marks — 80

Attempt ALL questions

DO NOT WRITE IN THIS MARGIN

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.**

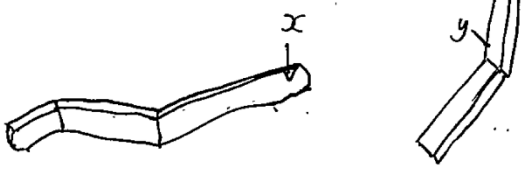
1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(a) Describe the 3D CAD constraints used to assemble the lever bend to the lever extension. You may use sketches to support your answer. 4

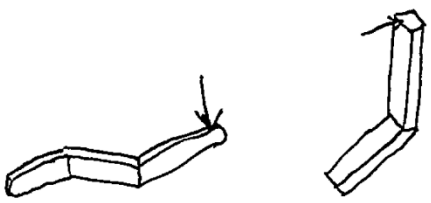
You should refer to the left-hand lever sub-assembly shown on **Supplementary Sheet 1 for use with Question 1(a).**

Use the mate command to attach surface x to surface y.



Use the align command to align the edge of the semicircle at surface x to the far edge of surface y.

Use an offset mate command (by 182.5mm) with the top of surface x and the very top of surface y.



The model should be fully assembled.

[Turn over

X7357701 03

MARKS | DO NOT WRITE IN THIS MARGIN

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 True Shape: Shows how the component actually looks, and not flattened for drawing. 1

(ii) View B Sectional end elevation: Provides the size of the fillet, which could not have easily been shown otherwise. 1

(iii) Dimension C Angle with tolerance: Shows the degree of accuracy required in the manufacture of the part. 1

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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 Standard drawing format allowing for FEA/stress analysis to identify & then edit faults. 1

(ii) .STL Standard Tesselation Language is the file format used before 3D printing. This would allow the model to be printed and tested. 1

(iii) .3DS A standard 3D model file that would allow for physical testing/aesthetic changes to the design 1

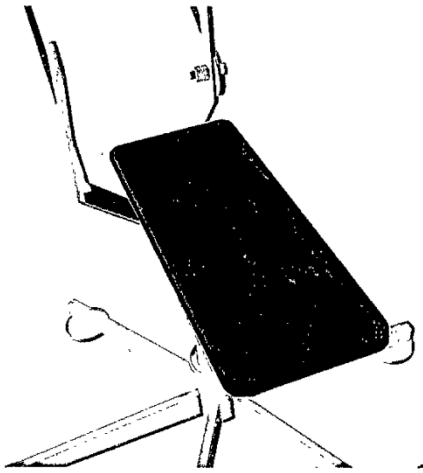
[Turn over

X735770105

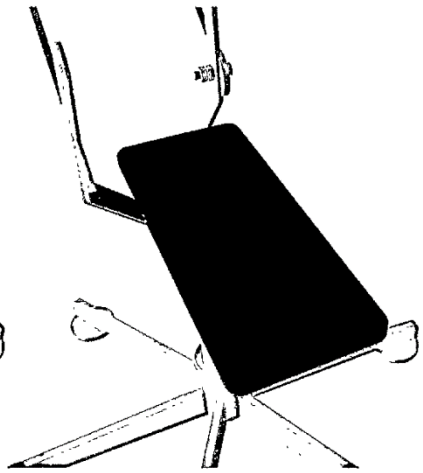
1. (continued)

DO NOT WRITE IN THIS MARGIN

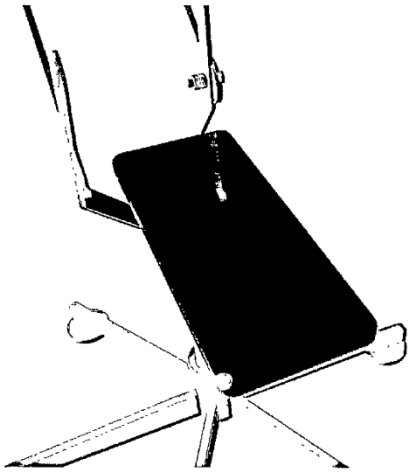
(d) A CAD illustration of the seat detail is produced. The stages of creating this detail are shown below. Stage 4 shows the final illustration.



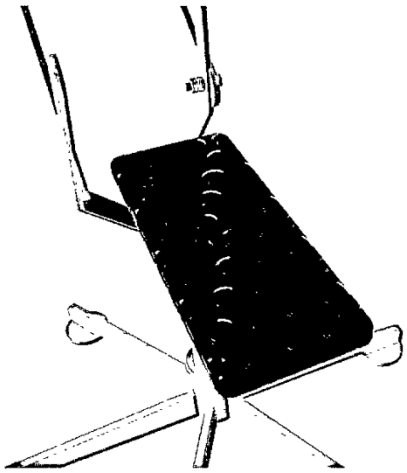
Stage 1



Stage 2



Stage 3



Stage 4

X7357701106

1. (d) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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 — 1

Texture Mapping: Applying A 2D image to a surface to give the appearance of a texture.

(ii) Stage 2 to Stage 3 — 1

Applied Lighting: Realistic lighting styles have been applied, such as point/distant lighting to give a realistic look to the render.

(iii) Stage 3 to Stage 4 — 1

Bump mapping: Applying a 2D greyscale image to a model to give the appearance of surface relief.

[Turn over

X735770107

1. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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. 1

.mpeg

(ii) State the name of a **vector** file type that could be used to show a rendered image of the finished excavator toy. 1

.gif

(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. 3

All colours are created with CMYK (or Pantone) to ~~show~~ create the most accurate print, as printers can only Print CMYK. All images and the document itself are to the correct size so there is no loss of quality through scaling.

All fonts/images are embedded to ensure the correct final product is produced. PDF could be used for this

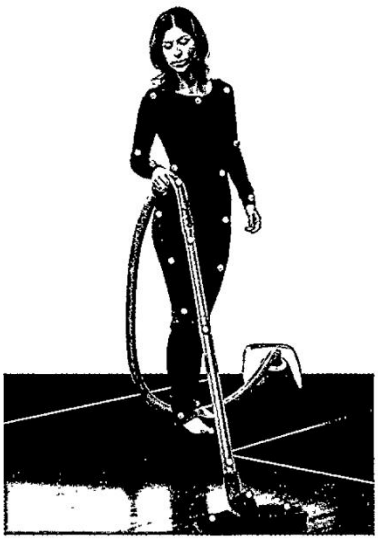
All bleed images should be extended past the crop marks to ensure the best print.

X7357701 08

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

Gives very realistic movement, as it is capturing a human. Allows the company to view the ergonomics of their product. The captured footage can be used in advertising for the product.

2. (a) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(ii) Describe three **disadvantages** of motion capture technology to the manufacturer. 3

Motion Capture Software is very expensive. The Software also requires training to use.

[Turn over

2. (continued)

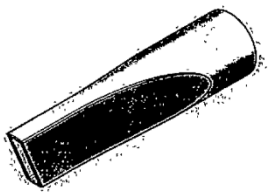
MARKS | DO NOT WRITE IN THIS MARGIN

(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 5



in a new sketch, create a circle.
on a parallel plane to this, sketch a rectangle with the same centre point.

Use the extrude, add material tool to extrude the circle towards the rectangle.

Use the loft tool to connect the rectangular sketch and the cylinder.

Use the shell tool, leaving a wall thickness, ~~wall at each end~~ all the way through, ensuring no end wall is left.
Use the fillet tool on the edges of the rectangular end (interior & exterior). Also fillet along the loft curve to create a smoother edge.

X7357701 12

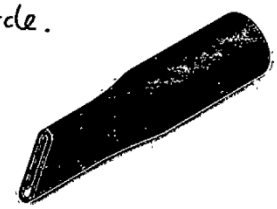
2. (b) (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(ii) Nozzle 2

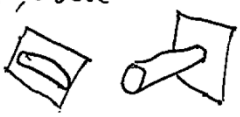
4

in a new sketch, create a circle.



create an angled plane some distance away and sketch a rounded rectangle, with the same centre point.

Extrude, add material, the circle towards the rectangle.



Use the Loft command to connect the two.

Use the shell tool to hollow the object, and removing the ends.

Use the fillet tool on the inside of the front of the nozzle to smooth it.

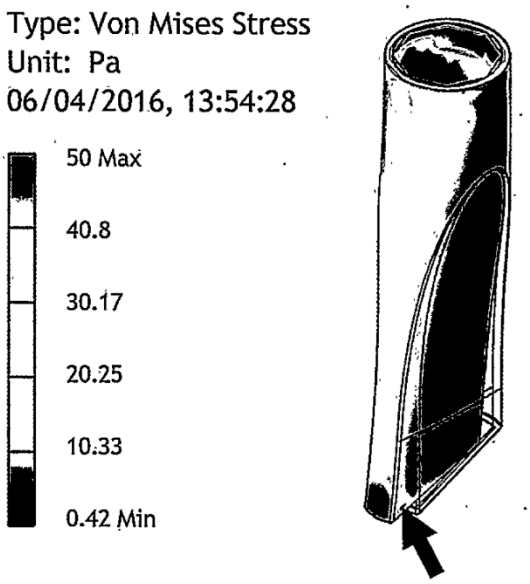
[Turn over

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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.



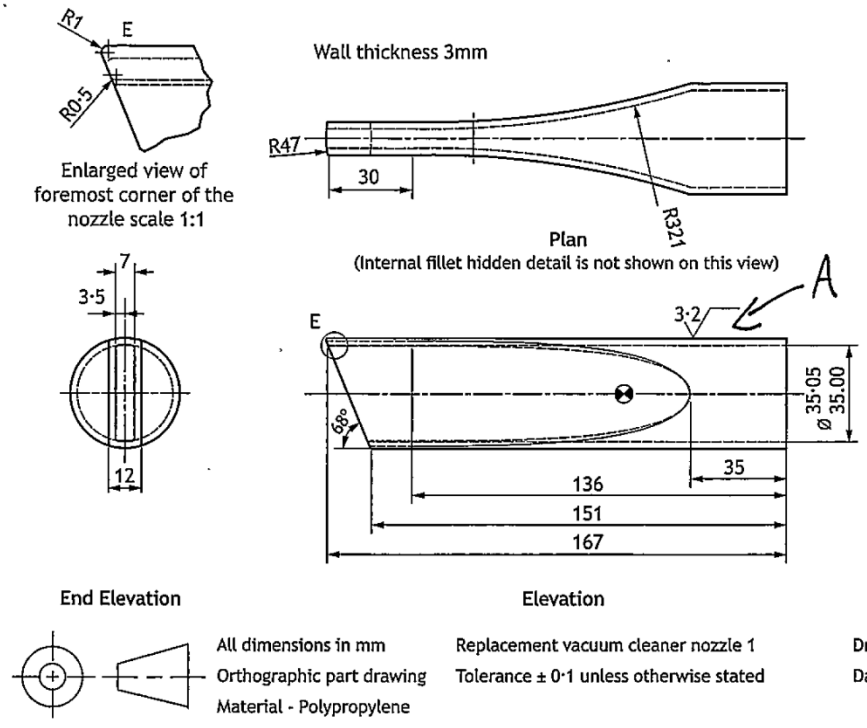
(c) Describe four set-up requirements that are necessary **before** the FEA simulation test can begin. 4

Gravity is set. Weights & materials are Any external forces (i.e. gravity) are set. All parts are given materials with set strengths. Any displacement is quantified and set. All forces are given a strength.

2. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

An orthographic CAD drawing of Nozzle 1 is shown below.



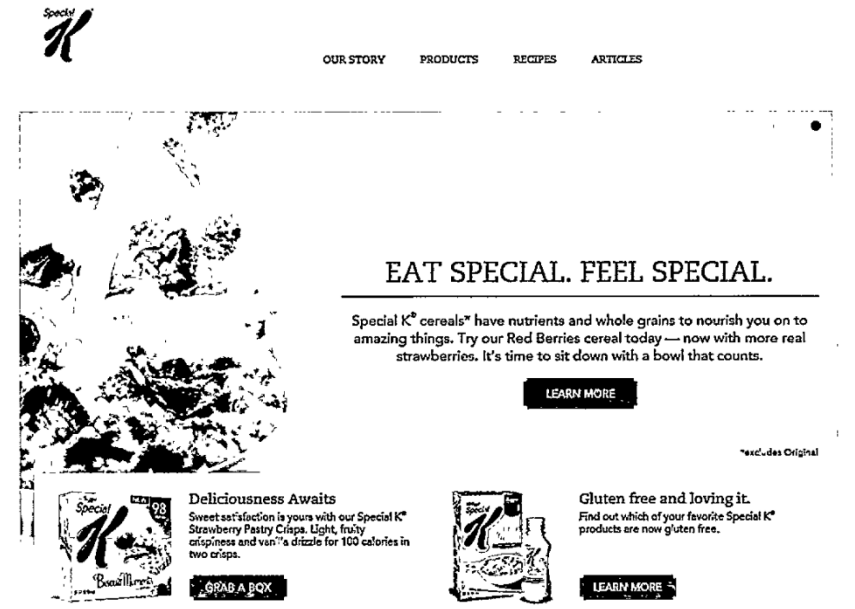
(d) Identify three pieces of information which have been included in the orthographic views shown above and explain how they would allow the nozzle to be manufactured using CAD CAM processes. 3

Tolerances allow for a degree of accuracy in the production of the nozzle while allowing it to still work correctly.
The machining symbol (labelled A) giving details on the machining of the surface.
Dimensions allow for the nozzle to be created to the correct size to be assembled and work fully.

MARKS | DO NOT WRITE IN THIS MARGIN

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. 4

1 Unity of all of the red and beige helps to tie all of the items together in an appealing and rhythmic manner.

2 Depth has been used by overlapping the top section with the lower one, making the page more appealing and flowing.

3 White space has been used to give a more relaxing, easy-reading design that is appealing to the eye by looking less cluttered.

3. (a) (continued) MARKS | DO NOT WRITE IN THIS MARGIN

4 Colour gradients have been used on the two lower sections to allow the eye to comfortably flow using rhythm.

(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 packaging for biscuits

Plastic packaging for individual cereal bars

Coated cardboard and foil yoghurt container with plastic lid

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

Different printing processes will be required for the products. The cereal bar and the plastic packaging ~~and coated cardboard~~ is ~~are~~ likely to use flexography due to the substrate choice ~~variety~~. Whereas the card board is likely to use rotogravure due to it's high speed and efficiency with long / large print runs. Screens can only display in RGB so the website will require this colour space, whereas the printed media will require CMYK for the printers, so colour conversion will need to be done with PMS or set colour.

3. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

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

Describe four requirements of a camera-ready copy for commercial printing. 4

All text fonts are embedded. All sizes & orientations are final. All colours are exactly specified / converted as required. The document is converted to a PDF before sending. All images are of sufficient quality so as not to appear blurry / pixellated. All bleed image are suitably bled off the document.

(d) State a suitable printing process to mass produce the cardboard biscuit packaging. 1

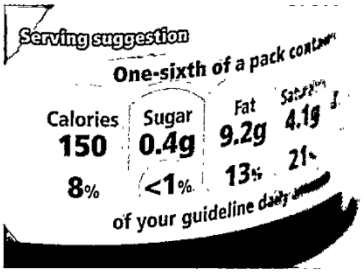
roto - gravure

3. (continued)

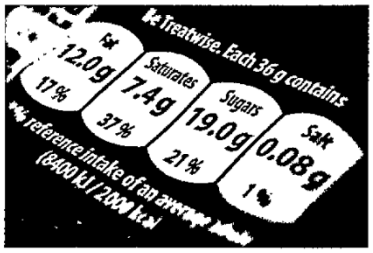
MARKS | DO NOT WRITE IN THIS MARGIN

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

Two examples are shown below.



Label 1



Label 2

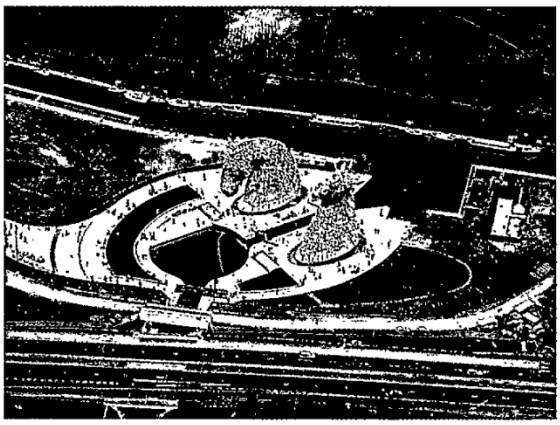
Explain, with reference to the labels shown above, how graphic techniques have been used to make the nutritional information as clear as possible. 4

Simple sans-serif fonts are used to allow easy reading. Contrasting colours are used to aid readability. Label 1 colour codes the different information boxes for eye-catching readability. High consistency of font & font colour ~~used~~ to aid unity and rhythm in reading. The numbers in the boxes are ~~[illegible]~~ in a larger font size to help them be read as they are the most important part.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

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



Aerial photograph of the Kelpies and the visitor's map of the Helix Park

(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. 6

Survey 1 Feature Survey

Purpose To show all existing land features, such as roads, paths, benches, street lights etc. that will need to be removed or deigned around.

4. (a) (continued)

DO NOT WRITE IN THIS MARGIN

Survey 2 Topographical survey

Purpose To show soil types, any rock outcrops or any existing buildings that will need to be removed or designed around.

Survey 3 Underground Survey

Purpose To identify and underground features such as pipes/cables or any unstable land that could ~~off~~ affect the project.

4. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(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 2

to create a 3D printed model for use in design modifications, and also in promotional material. To create a model for destructive testing to test for design faults.

(ii) structural engineer 2

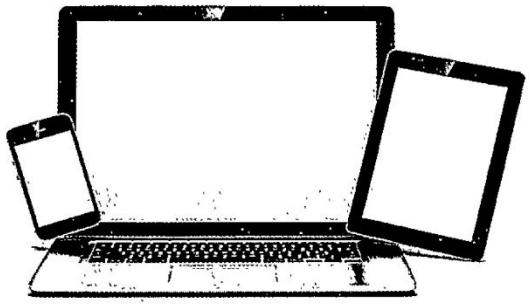
to perform FEA on the model to test the strength of the build. To perform CFD on the model to monitor airflow around the structure.

(iii) construction trades 2

To asses the materials required by different professionals for the construction. To view how the structure will look when fully assembled to aid in the assembly

MARKS | DO NOT WRITE IN THIS MARGIN

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. 3

Internet adverts are always a way to catch someones eye, particularly pop-up adverts.

Using digital media gives the company being advertised a more "green" or eco-friendly look in the public image.

There is a far larger audience online, providing a far larger viewership for advertising.

Digital media is far more accessible for people to use.

5. (continued)

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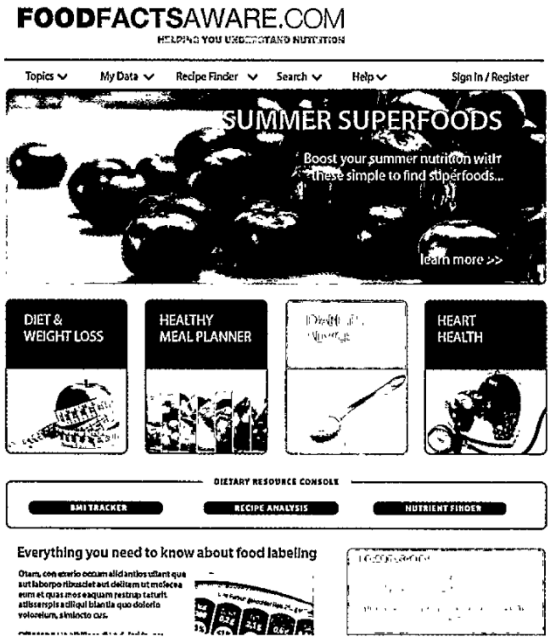
A website called "foodfactsaware.com" helps consumers understand more about information displayed on food packaging. The web page shown in the image below features drop down menus allowing consumers to access additional content. This takes the form of video interviews with professionals, printable fact 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 3

Clear, simple sections to allow easy navigation. ~~Contrasting colours for each section to help distinguish them.~~ Easy, collected dietary resource console to keep similar information together. Large image and heading at the top to bring in the eye then allowing it to flow down the page.

5. (b) (continued)

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(ii) User interface 3

Easy and compact drop down menus are very simple and take up less space. Colour separated sections to help distinguish this. "Learn more" is in the same colour and font as the sub-heading, allowing it to be more easily connected/ recognised and used.

(iii) Graphic media file formats 3

Videos are very useful and dynamic for educating people.
Fact sheets are a printable, interactive way for users to learn from the website.
Annotated photos are simple and easy to use, and a very visual education method.

[END OF QUESTION PAPER]

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