Developing Prototypes

Warm-Up

Draw circles to show whether the statements below are **true** or **false**.

Prototypes are scaled down versions of the product or system.	**True** /	**False**
Prototypes are made using materials and manufacturing methods that are intended for the final product.	**True** /	**False**
Prototypes are not designed to be fully functional — they are only designed to look like the final product.	**True** /	**False**

1 A designer has made a prototype of a tent. The prototype is shown in **Figure 1**.

Give **three** possible reasons why a prototype of the tent was made.

1. .....

.....

2. .....

.....

3. .....

.....

[3 marks]

Figure 1

2 A designer has made a prototype of a label for a shampoo bottle. **Figure 2** shows the design specification. **Figure 3** shows the prototype.

The label should:
- show the name of the product and what it smells of
- have a futuristic or scientific appearance
- include an image of glossy hair

Figure 2

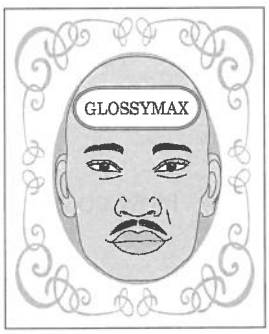


Figure 3

Evaluate the prototype of the label against the design specification.

Remember, 'evaluating' a prototype against a specification means checking whether each point on the specification is met by the prototype.

.....

.....

.....

.....

.....

[4 marks]

3 **Figure 4** shows a prototype for a children's coat.
Figure 5 shows the design specification for the coat.

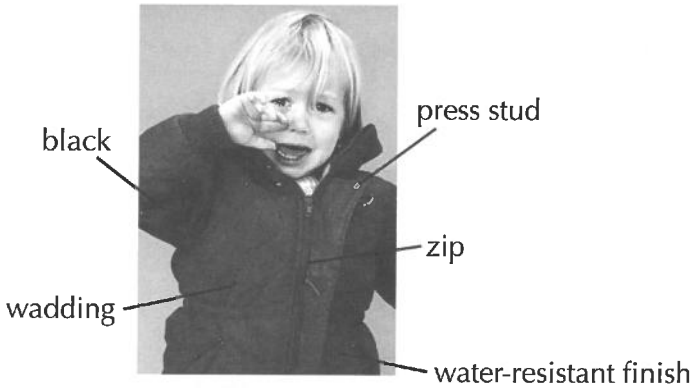


Figure 4

Design specification
- it must appeal to children
- it must be a winter coat
- it must include a way of fastening the coat
- it must be highly visible for road safety purposes

Figure 5

a) Which **two** points on the design specification might the prototype not meet? Give a reason for each point.

1. .....

.....

2. .....

.....

[2 marks]

b) For each point stated in **a)**, suggest **one** improvement that could be made.

1. .....

.....

2. .....

.....

[2 marks]

c) How could the designer see if the changes suggested in part **b)** improve the product?

.....

.....

.....

[2 marks]

d) When can production of the coat on a larger scale be considered?

.....

.....

[1 mark]

Score: ☐ / **14**

Using Materials Efficiently

Warm-Up

A range of tools and equipment used in marking out are listed below.
Draw lines to match each tool with the description of how it is used in marking out.

Odd-leg caliper	**Used to transfer markings onto a fabric that you can remove later.**
Try square	**Drawn around to mark out the same shape.**
Scriber	**Marks a line parallel to an edge.**
Tailor's chalk	**Used like a pencil to scratch a mark into metal and plastic.**
Templates	**Helps to accurately mark out right angles.**

1 When batch or mass producing a product, identical shapes are often cut from sheets of material. Careful planning of an efficient arrangement for these shapes can help to minimise waste.

a) What is the name of this planning process?

.....

[1 mark]

b) Give **two** reasons why manufacturers try to avoid wasting materials.

1. .....

2. .....

[2 marks]

c) Explain how using a design that tessellates can help to reduce waste.

.....

.....

[2 marks]

d) Show that the shape in the box below will tessellate.

[1 mark]

2 Marking out is one way of reducing the waste produced when making a product.

Explain how marking out can help to reduce waste.

.....

.....

.....

[2 marks]

3 A manufacturer is cutting blocks from a piece of wood that measures 5 × 5 × 240 cm.

He is able to use 5775 cm^3 of the material. What volume of waste material will he have?

.....

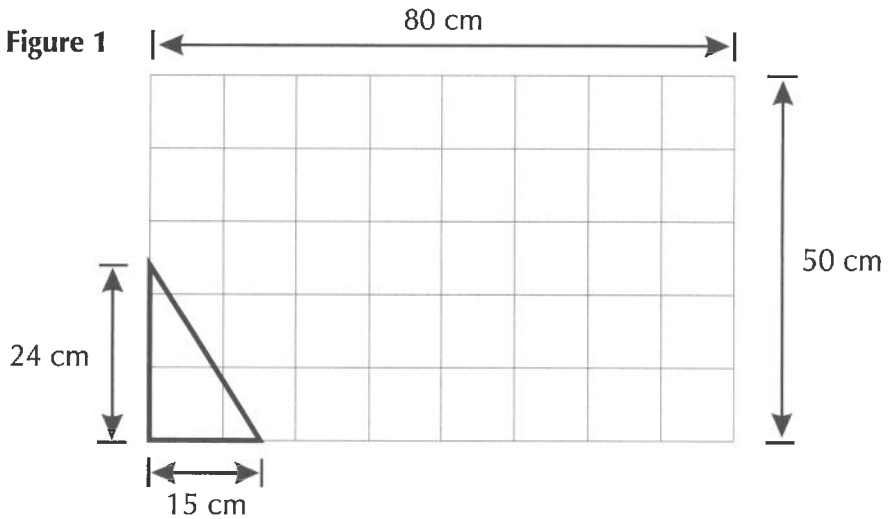
.....

[2 marks]

4 Triangles are to be cut from the sheet of material shown in **Figure 1**. The triangles need to be arranged so that as many of them as possible can be cut from the sheet.

a) Repeat the triangle shown in **Figure 1** to show the arrangement that results in the least possible waste material.

Figure 1



[1 mark]

b) Calculate the area of **one** triangle.

.....

.....

[1 mark]

c) Using your answers to **a)** and **b)**, calculate the minimum amount of material wasted from cutting the triangles from the sheet in **Figure 1**.

.....

.....

[3 marks]

Score: ☐ / **15**

Working Safely

1 **Figure 1** shows a man cutting wood using a circular saw.

Figure 1

Give **two** things he should do to carry out the task more safely.

1. .....

2. .....

[2 marks]

2 Safety is vital when designing and manufacturing a product.

a) Suggest **one** piece of protective clothing or equipment that should be worn when carrying out each of the following activities:

i) Tacking a fabric using a needle and thread.

.....

[1 mark]

ii) Drilling with a piece of noisy machinery.

.....

[1 mark]

iii) Sanding a material that produces a lot of dust.

.....

[1 mark]

b) Other than wearing appropriate protective clothing, give **one** safety precaution that should be taken when handling toxic chemicals.

.....

[1 mark]

c) Other than wearing appropriate protective clothing, give **two** general safety rules that should be followed when operating machine tools.

1. .....

2. .....

[2 marks]

3 Risk assessments are used to identify and minimise any risks when working.

Give **one** hazard of welding and **one** precaution that could be taken to reduce this risk.

Hazard: .....

Precaution: .....

[2 marks]

Score: ☐ / **10**