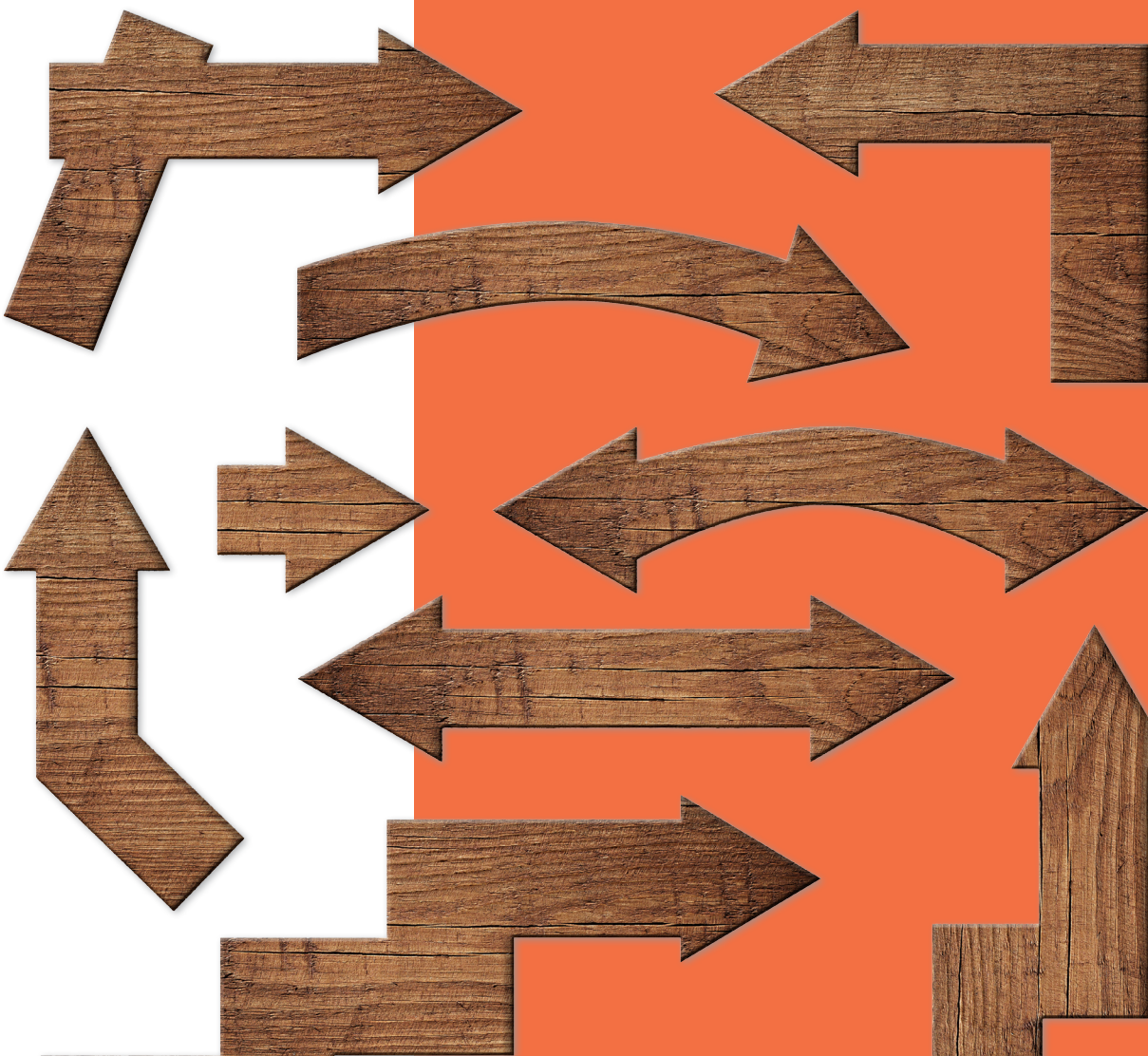
AQA
Realising potential

GCSE DESIGN AND TECHNOLOGY

(8552)

Marked student responses

EXAMPLE RESPONSES



Whilst every attempt has been made to show a range of student responses, the following responses and examiner comments provide teachers with the best opportunity to understand the application of the mark scheme. They are not intended to be viewed as 'model' answers and the marking has not been subject to the usual standardisation process.

Please note that Q14 and Q21 refer to data on the previous pages. The references to page numbers in each of the questions have been changed from the original SAMs to reflect this.

SECTION A – Core Technical Principles

1 A designer has created a security system for use in a home. The system is intended to alert the home owner to an intruder. What is the input in this system?

A Alarm sound ⬭

B Automatic message sent to mobile phone ⬭

C Flashing light ⬭

D Motion sensor ●

[1 mark]

Student has correctly identified the only possible input block. The other three possibilities are all outputs. Care needs to be taken colouring in each lozenge to avoid error in the response being credited correctly. Response **D** is correct.

[1 mark]

2 **Figure 1** shows a stool.

Figure 1

When a person sits on this stool, what is the main force on the stool leg?

A Compression ⬬

B Shear ⬭

C Tension ⬭

D Torsion ⬭

[1 mark]

The weight of the person opposes the resistance the ground provides, hence compression is the correct answer. Response **A** is correct.

[1 mark]

3 Which of the following metals should not be used outdoors without a protective coating of a different material?

A Aluminium alloy ⬭

B Copper ⬭

C Low carbon steel ●

D Zinc ⬭

[1 mark]

Low carbon steel is a ferrous metal and one that rusts if used outside without a protective coating. Response **C** is correct.

[1 mark]

4 Which **one** of the following is a production method based on providing stock as it is needed?

A Computer Aided Manufacture ⬭

B Flexible Manufacturing ⬭

C Integrated Manufacture ⬭

D Just in Time Manufacturing ●

[1 mark]

Just in time manufacturing is the only response that requires stock to arrive as it is needed to make products. Response **D** is correct.

[1 mark]

5 Which **one** of the following statements is true?

A Balsa is a natural material used in model making ●

B Medium Density Fibreboard is a man-made material commonly used for outdoor furniture ○

C Silk is a man-made material used in the textiles industry ○

D Urea formaldehyde is a natural material used to manufacture electrical sockets ○

[1 mark]

Balsa is a naturally occurring timber material and is used in model making. Response **A** is correct.

[1 mark]

6 What is the definition of a smart material?

A A material that can hold data ○

B A material that can withstand excessive force ○

C A material that reacts to changes in the environment ●

D A material that shrinks when heated ○

[1 mark]

Smart materials change their properties in response to a change in their environment or surroundings. Response **C** is correct.

[1 mark]

7 Designers often create products that they know will have a limited life span. What is this called?

A Design for disassembly ⬭

B Design for maintenance ⬭

C Planning for manufacture ⬭

D Planned obsolescence ●

[1 mark]

Products that only work for a predetermined amount of time are said to have built in or planned obsolescence. Response **D** is correct.

[1 mark]

8 Which of the following is a thermosetting polymer?

A Acrylic (PMMA) ⬭

B High Density Polythene (HDPE) ⬭

C Polyester resin (PR) ●

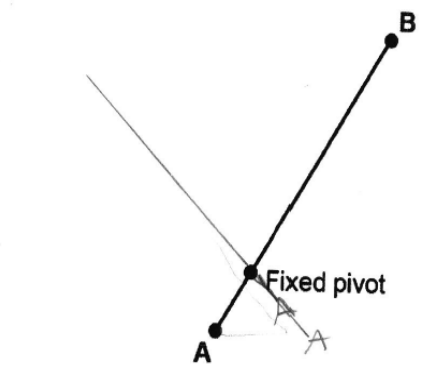
D Polypropylene (PP) ⬭

[1 mark]

Polyester resin is the only response that is a thermosetting polymer. The other three responses are examples of thermoplastic polymers. Response **C** is correct.

[1 mark]

9 The diagram below shows the movement of a lever which is part of a toy.
The distance from point **A** to the pivot is 10mm.
The distance from point **B** to the pivot is 40mm.
If point **A** moves 10mm to the right, how far would point **B** move to the left?



A	10mm	●
B	20mm	○
C	40mm	○
D	50mm	○

[1 mark]

If point A moves 10mm anticlockwise about the fixed pivot, point B will move 40 mm anticlockwise.
Response **C** is correct.

[0 marks]

10 Which **one** of the following is a softwood?

A Beech ⬬

B Mahogany ⬭

C Oak ⬭

D Spruce ⬭

[1 mark]

Spruce is a softwood. The other three responses are all natural hardwoods. Response **D** is correct.

[0 marks]

11 State **two** properties of natural fibres that make them suitable for clothing.

[2 marks]

Property 1 The clothes can be washed easily

Property 2 Thermal – keeps wearer warm

As in mark scheme – can be washed (1).
Thermal explained worth a mark (1).

[2 marks]

12 State **two** reasons why corrugated cardboard is used as packaging for cooked pizzas.

[2 marks]

1. Corrugated cardboard is rigid, meaning the contents will be protected from being dropped etc.

2. Corrugated cardboard has two layers, which would prevent heat escaping and keeping contents warm.

Student has correctly provided understanding about corrugated cardboard being rigid to protect (1) and the fact in this application it can keep contents warm(1).

[2 marks]

13 . 1 In 2010 the use of renewable energy in the UK accounted for 6.5% of total energy usage. By 2015 this figure had increased to 25%.

Give **two** reasons for the increase in the use of renewable energy sources.

[2 marks]

1. natural energy resources are running out meaning we need to turn to renewable energy sources for sustainability

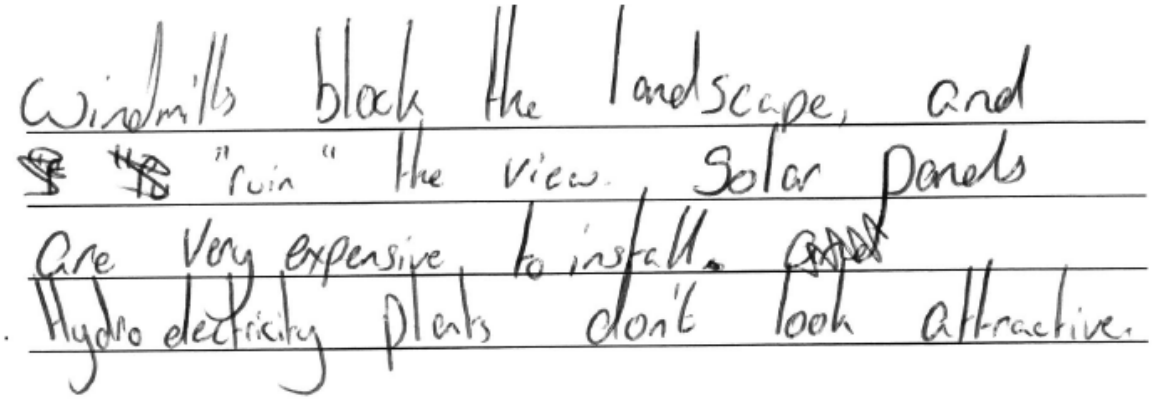
2. harmful effects on the environment are caused by CO_2 etc. so we use renewable energy sources to cause less damage

The first reason is qualified and provides more than enough detail for a mark (1). The second reason considers harmful effects of CO2 emissions and how renewable energy can cause less damage (1).

[2 marks]

13 . 2 Explain why some people are opposed to the use of renewable energy sources.

[2 marks]



Student has expressed the idea of windmills blocking and ruining the view ie visual intrusion (1). Solar panels are expensive to install ie cost (1).

[2 marks]

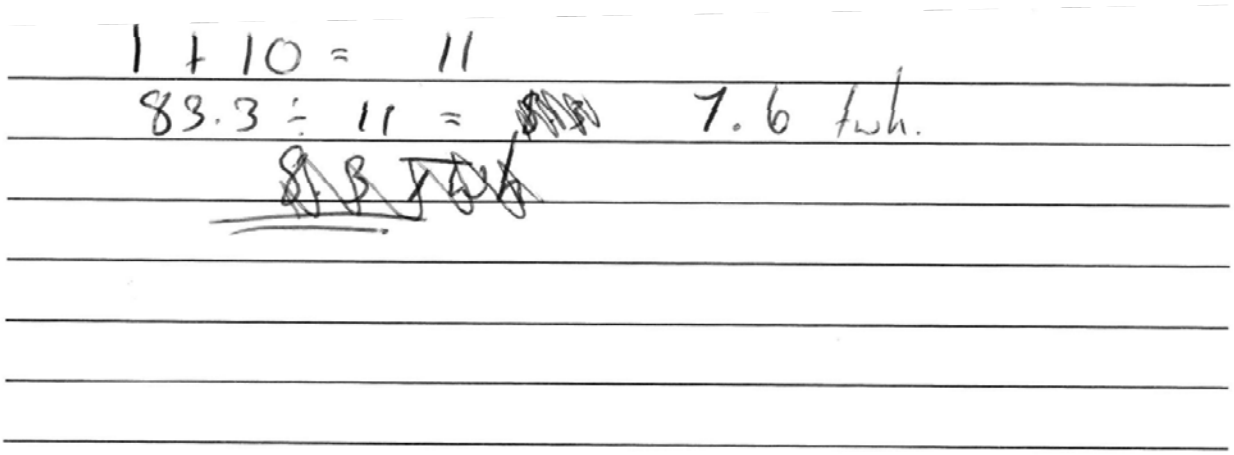
13 . 3 The amount of renewable energy generated in 2015 was 83.3 Terawatt hours (TWh).

The ratio of solar power to other forms of renewable energy was 1:10.

What amount of energy was attributed to solar power?

Give your answer to 1 decimal point.

[2 marks]



One mark awarded for correct answer of 7.6 TWh to one decimal point. No mark for 83.3 divided by 11 as the answer to 3 decimal places (7.572) has not been provided.

[1 mark]

SECTION B – Specialist Technical Principles

The following are examples of different stock forms.

Stock forms				
Acrylic rod	Corrugated cardboard sheet	Aluminium sheet	Wool yarn	Medium Density Fibreboard (MDF)

14 Choose **one** of the stock forms in the table **above.**

Name **one** of the primary sources it is made from.

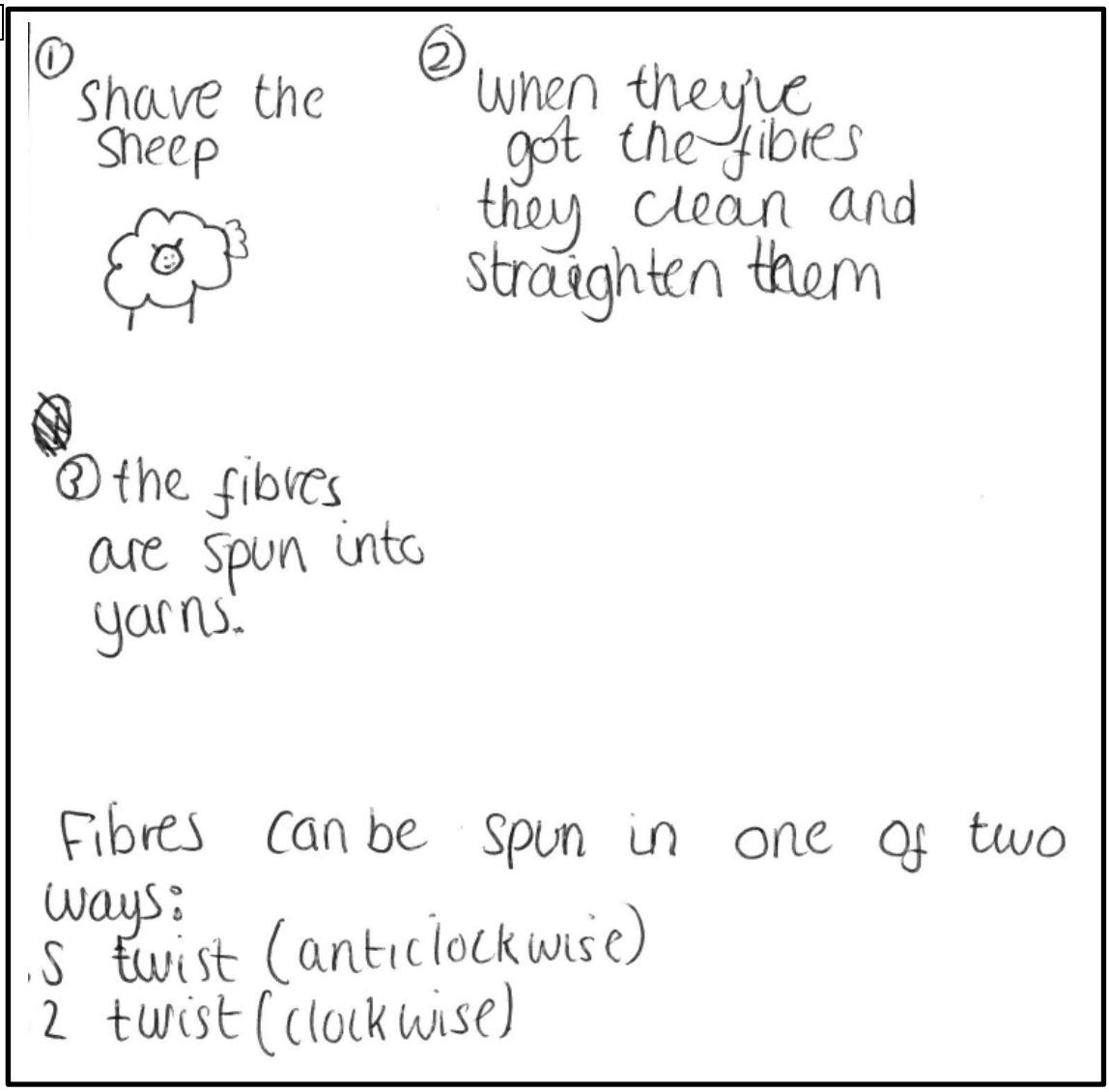
In the box below, use notes **and/or** sketches to explain the process of changing it from primary source to stock form.

[5 marks]

Name of stock form: Wool yarn

Name of primary source: animals (sheep coat)

14



Reference to sheep's coat is worth a mark for appropriate source (1).
Explanation of process has been awarded 2 marks. Credit not awarded for 'shave the sheep' – shear would have been correct. One mark for cleaning and straightening fibres. One mark for spinning into yarns.

[3 marks]

15 Describe **two** ways that materials **and/or** products are strengthened **or** reinforced.

Give examples in your answer.

[2 x 2 marks]

1. Paper - Laminating; makes it waterproof, done by putting a laminating polymer pouch over paper which means it won't go soggy when exposed to water.

2. Concrete + Reinforced with steel rods to make it more secure and strong. It allows it to be used in more intensive than normal.

Paper laminating is clearly understood and student provides example of polymer pouch over paper (2). Concrete being reinforced is explained and example of how it is better in tension provided (2).

[4 marks]

16 . 1 Choose **one** product or component in **Figure 2** and describe **two** features that make it suitable for mass production.

[2 x 2 marks]

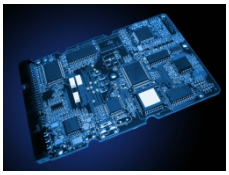
 Steel car door	 Polymer toy musical instrument	 Newspaper	 Cotton T - Shirt	 Printed Circuit Board	 Flat pack furniture

Figure 2

Name of product/component Printed circuit board

Feature 1 ease of soldering - because the board has a copper layer on it, after tracks are formed ~~flow~~ wave soldering can be used to fix lots of components quickly at one time

Feature 2 laminated with copper - no need to add lots of wires to join components together. Tracks can be etched or cut by CNC to create accurate tracks with the correct spacings for different components

Feature 1 – reference to ease of soldering and how wave soldering can be used (1) to fix lots of components at one time (1).
Feature 2 – ability to etch or cut tracks without lots of wires to join components (1) allowing for accurate tracks and correct spacing for components (1).

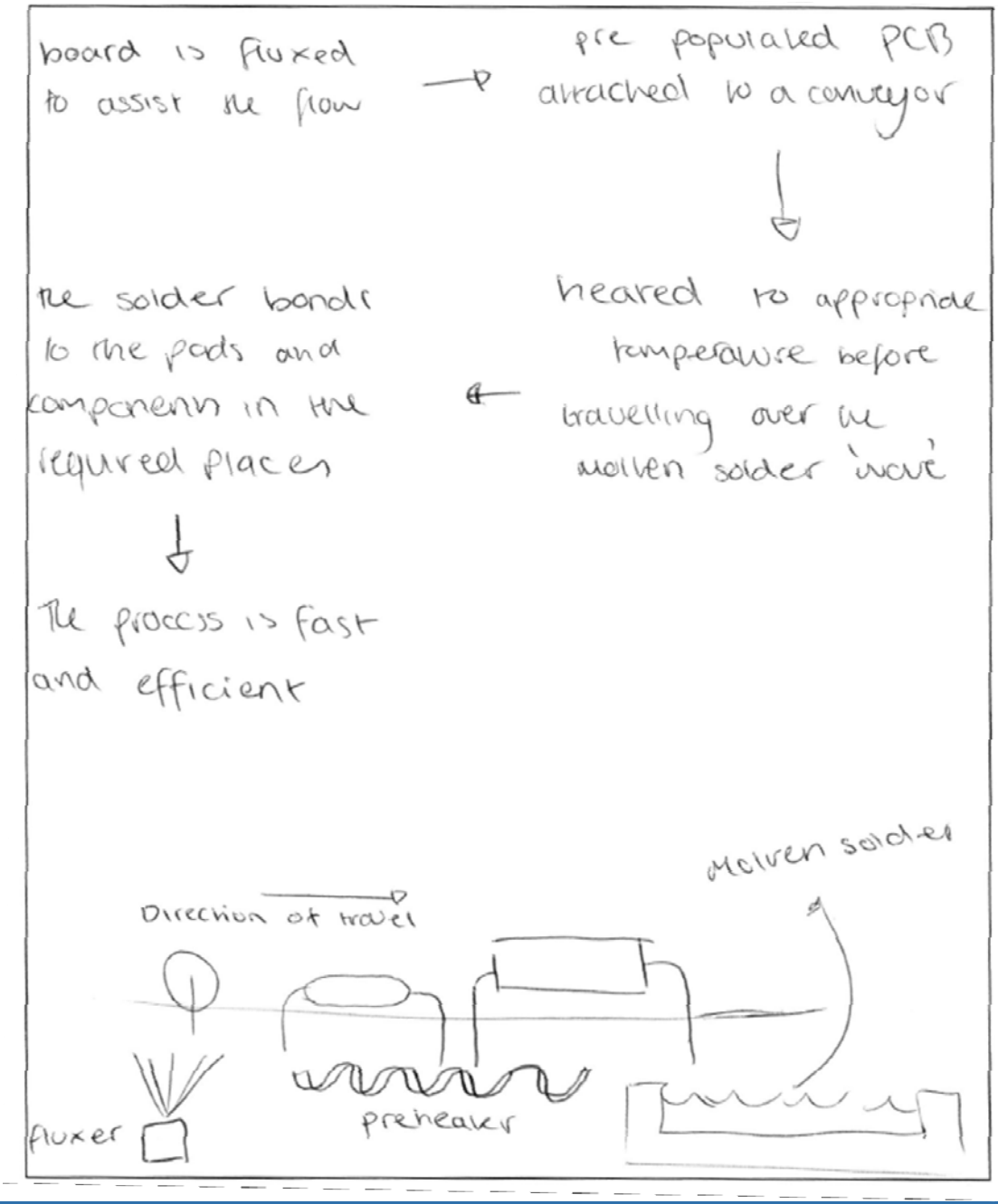
[4 marks]

16 . 2 Name **one** industrial process used in the manufacture of the product or component you have chosen for question **16.1**.

In the box below, use notes **and/or** sketches to explain this process in detail.

Name of industrial process: wave soldering

[5 marks]



One mark for correct appropriate process – wave soldering (1).
A sound response supported with a labelled diagram but some additional detail lacking in relation to mechanical movement and specific temperature (3).

[4 marks]

17 Circle **one** of the following and give **two** reasons why its characteristics or physical properties are suitable for its intended use.

- **Polypropylene** – for a school stacking chair
- **Foam core board** – for a display board
- **Brass** – for a trumpet
- **Pine** – for a bedroom wardrobe
- **Silk** – for use in a men's tie
- **Printed Circuit Board (PCB)** – for use in a hand held game

[2 marks]

1 Waterproof - Can clean water off or other liquids if food and drink is spilt if chair is in a canteen.

2 Colour can be applied which will allow for a wide range of different aesthetic looks

Student has selected polypropylene for a school stacking chair. There is no mark for this, but it is required to provide a focus/context for both reasons.
Waterproof is fully explained (1).
Colour is fully explained (1).
Both these responses are very detailed and easily worth two marks.

[2 marks]

18 Designers sometimes choose materials according to their impact on society and the environment.

Examples include the use of fair trade cotton, recycled components and biodegradable packaging.

Evaluate how the use of such materials might be seen as the ethical choice.

[10 marks]

The use of fair trade cotton; it will allow third world people to get given a fair price for their goods which will allow money to flow into the community and allow the children to be educated and doctors to be hired which will help the society improve. Recycled components will allow valuable materials such as gold and aluminium to be melted down and reused. Recycling the materials will save on the energy needed to produce them which will reduce carbon emissions and help climate change. Recycling materials will save landfill space.

Response is band 7–8 marks.
Student has provided a logical response considering both fair trade cotton and recycled components from the example list. Both are well analysed and evaluated and conclusions drawn.
There is no consideration of biodegradable packaging or other examples to support the answer, so it cannot be considered to be an excellent understanding of issues.
Analysis and evaluation of considered points is better than band 3 description.
Holistic judgement is of a response in the bottom of the second band descriptor ie 7 marks.

[7 marks]

SECTION C – Designing and Making Principles

The product below is a GPS Sports Watch worn by adult runners to monitor activity and aid training.

Specification

- Lightweight
- Waterproof (face and strap)
- Rechargeable battery
- Battery lasts up to 3 weeks (10 hours in GPS mode)
- Watch features include; time, date, calendar, alarm, touchscreen and GPS for recording sporting data.

Evaluate the watch in terms of its:

19 . 1 suitability for the user

[4 marks]

The strap is flexible so therfore can fit to the users wrist easily. The watch face is smooth so no cuts on the users skin would occur. This might mean that the sun reflects off the watch face though. The watch is light weight this lets the watch be worn without a physical effect. The is a easily adjustible strap which will make the watch wearable for a longer life when the user grows. Long battery life is also better for the user. The watch is also water proof this lets it be able to be worn whilst in a pool etc.

A well described and justified analysis. Many positive factors and one negative factor discussed in terms of the watch face being smooth. A full response.

[4 marks]

19 . 2 aesthetic quality

[4 marks]

the watch has a smooth well designed finish. This makes it look better. The rubber that the strap is made out of is very durable. ~~The watch has~~

Some confusion in understanding as durability is being considered and that is not an aesthetic feature. Reference to smooth well designed finish worth a mark (1).

[1 mark]

19 . 3 ergonomics

[4 marks]

The strap is flexible this mates it easy to wear and has and easily adjustable wrist strap.

Two brief points considering the flexible strap and adjustability can be identified (2).

[2 marks]

20 . 1 Explain what is meant by the term 'anthropometrics' and why it is important for designers to consider.

[4 marks]

~~Study of hand and feet sizes~~

~~The~~ The study of human body part sizes ~~to~~ relate to a product. This is needed so that ~~the~~ product is the right size ~~for~~ for the user and buttons etc are in the right place.

Response correctly identifies (clear knowledge) that anthropometrics is the study of human body part sizes. Some consideration that the product is suitable for the user ie right size. Reference to buttons in the right place is ergonomics and not worthy of credit.

[3 marks]

20 . 2 Name **two** anthropometric measures that might be used in the design of a watch. Explain why each is appropriate.

[2 x 2 marks]

1. The width of the wrist so the the strap will fit propely.

2. The buttons need to be the right width apart so when you press one they both are not pressed at the same time

Measure 1 – width (1) so the strap will fit properly (1).
Measure 2 – no link to size of people's finger tips (0) but explanation of size of finger tips is explained in terms of button size and positively rewarded (1).

[3 marks]

21 . 1

You have been asked to redesign the watch shown on **page 18** to make it suitable for a child aged between 9 and 11 years old.

The data in the table below shows the preferred colour scheme according to 240 children aged between 9 and 11 years old.

Complete the table by calculating the missing percentage of children who like different colours.

[1 mark]

Colour Scheme	Number of children	Percentage of total
Pastel colours	60	25%
Primary colours	102	42.5%
Fluorescent colours	36	15%
Subtle colours	30	12.5%
Metallic colours	12	5%
Total	240	

102 ÷ 240 x 100 = 42.5%

30 ÷ 240 x 100 = 12.5%

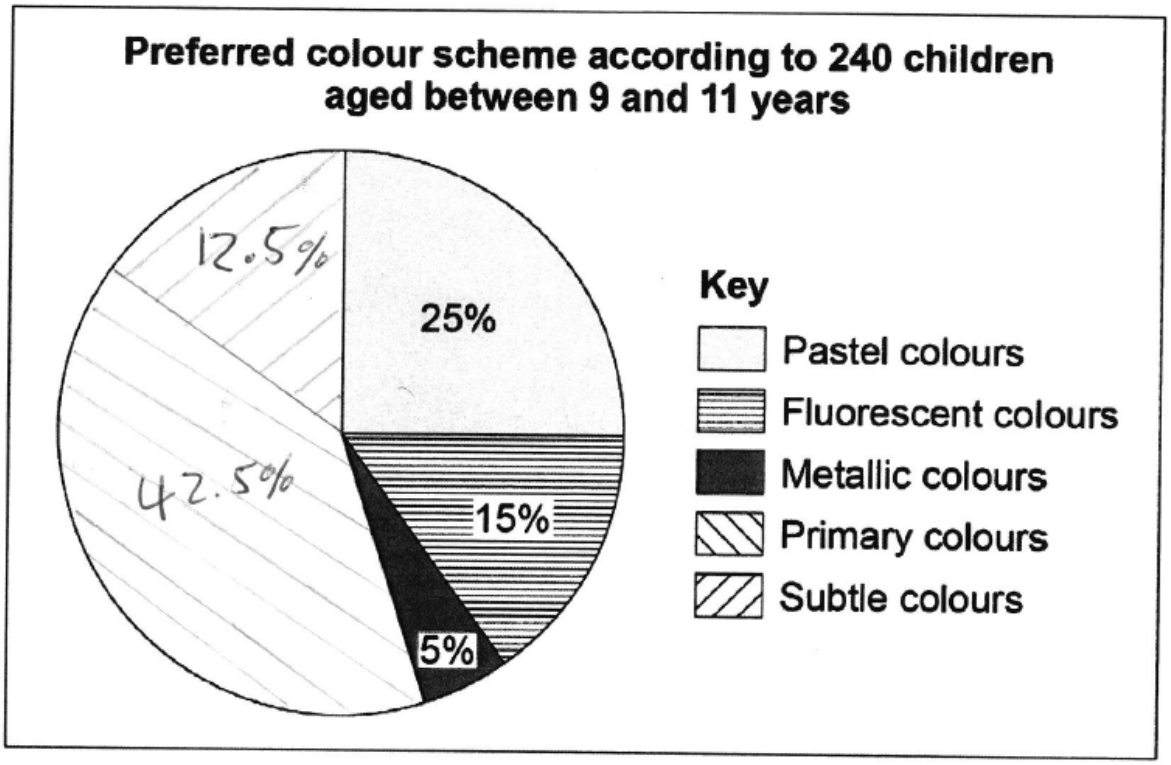
Both percentages calculated and given are correct (1). NB Not 2 marks.

[1 mark]

21 . 2 Using the information from the table in question **21.1** complete the pie chart below showing the **percentages** of children who like different colours.

You must show your calculations.

[2 marks]



3.6° = 1%

Primary colours 3.6 x 42.5 = 153°

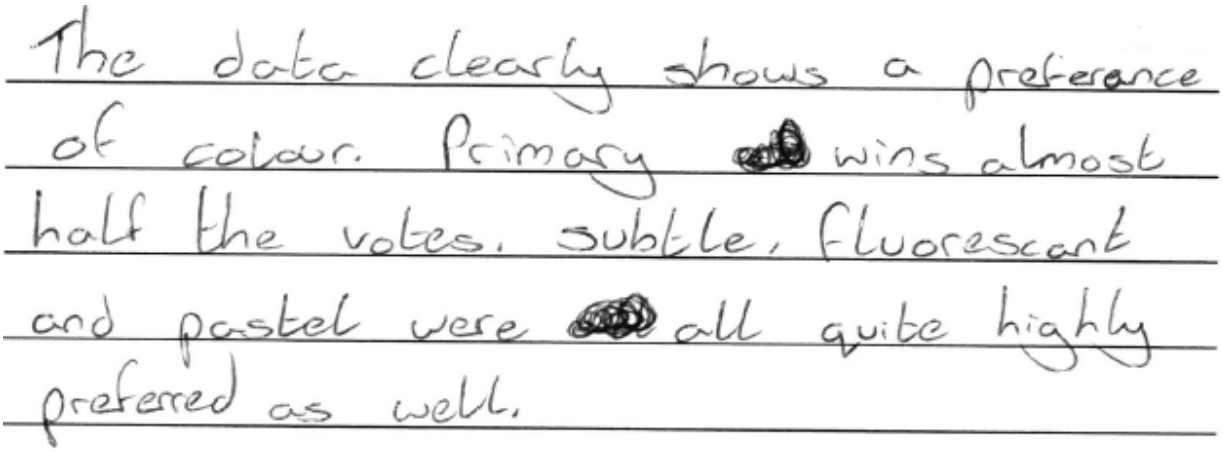
Subtle colours 3.6 x 12.5 = 45%

Student has first worked out that 3.6 degrees equates to 1% (no credit), but clearly clarifies understanding of question requirements.
Subsequent calculation for percentages for primary colours and subtle colours have been correctly calculated for a mark each (2).

[2 marks]

21 . 3 Explain how this data would influence the way product could be redesigned.

[3 marks]



Observations are correct with a focus on all colours. There is no consideration of how the data would influence a redesign eg children clearly would like a brightly coloured watch etc. Cannot be a maximum mark award.

[2 marks]

22 . 1 Study the image and specification of the watch on **page 19**.

You have been asked to redesign the watch for a child aged between **9** and **11** years old. In order to make the watch more appealing to children it should allow for activities other than running.

Give **four** changes or additions to the original design specification and explain how each would make the watch suitable for the new target market.

You should **not** refer to the colour of the watch in your answer.

[8 marks]

1 Add a distress alarm in case the child gets hurt or is in danger.

2 Make it smaller to fit on the kids wrist

3 Cyber safety feature

4 Tracker to see where the kids are.

Change 1 – reference to adding an alarm is explained (2).
Change 2 – reference to making it smaller is explained in just enough detail (2).
Change 3 – cyber safety feature is not explained (1).
Change 4 – tracker feature but explanation is too vague for credit (1).

[6 marks]

22 . 2 Explain why having a design specification is important to designers and how this helps to ensure a successful outcome.

[3 marks]

It can be used as a criteria for manufacturing the product to make sure everything is there that needs to be there.

Basic understanding of how a specification can be used in manufacturing. No clear reference to evaluating product. Student has expressed a view 'to make sure everything is there that needs to be there'. This statement is too vague to merit credit.

[1 mark]

23 . 1 Name a suitable material **or** system that designers might use to create a model of a design.

[1 mark]

Circuit Wizard

A correct virtual modelling software for electronics is given (1).

[1 mark]

23 . 2 Explain why designers create models of their designs before final manufacture.

[3 marks]

By making a model it will allow you to see if it is going to work or not, testing if materials will work or not, seeing if certain parts of the design work. They can experiment and change the design. Etc.

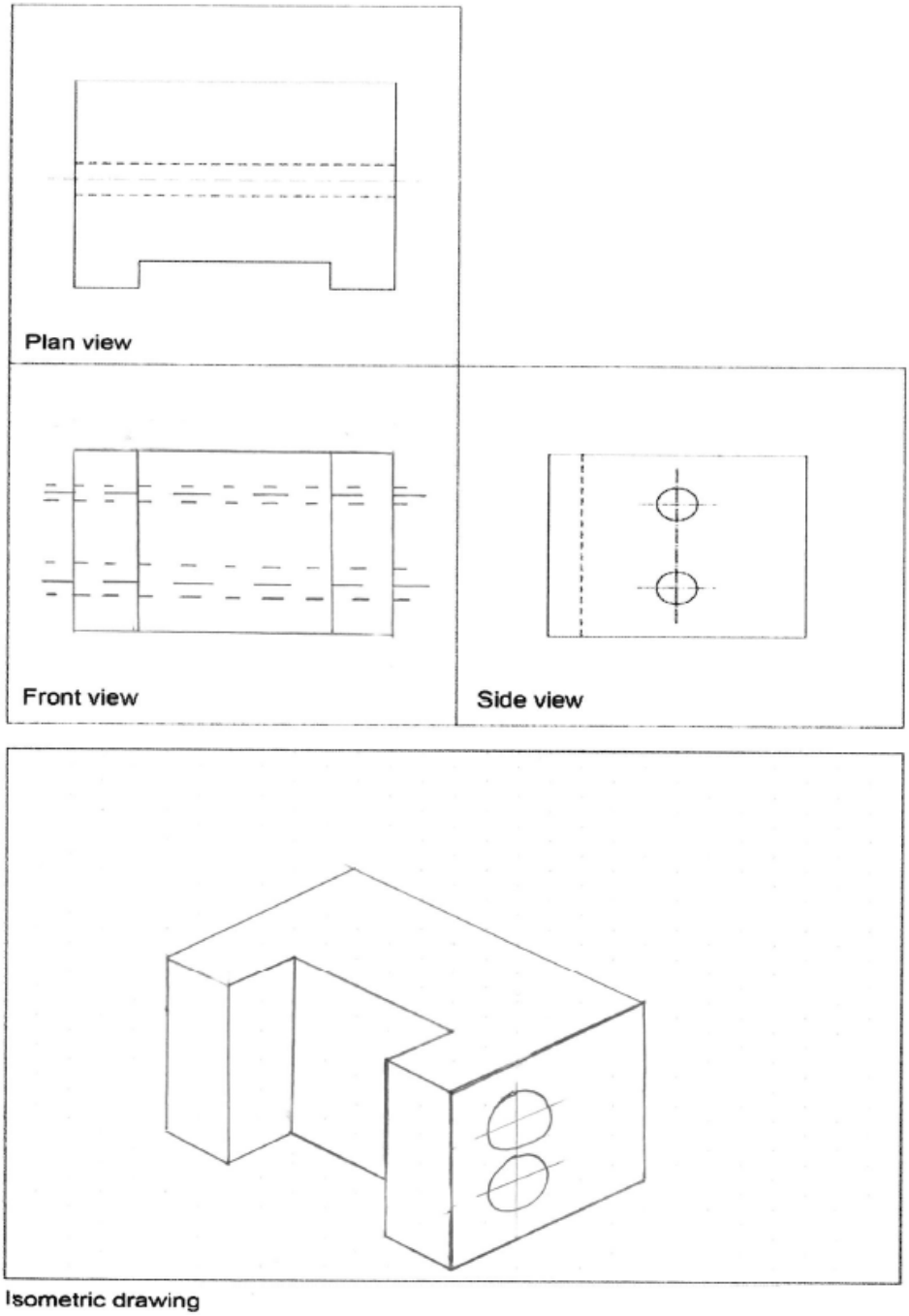
Response talks about using models to see if 'it is going to work or not'. (1) Testing materials adds more detail but explanation is a repeat of work or not explanation (0). Further understanding demonstrated in how designers can experiment and change design is credit worthy (1).

Total: [2 marks]

24 Below is a drawing of part of a point of sale display.

Complete the third angle orthographic projection by adding a **front view** and **isometric drawing** of the shape in the boxes provided.

[5 marks]



Front View:
Shape is correct(1)/hidden detail is correct (1).

Isometric drawing:
General shape is correct (1)/indent is correct(1)/holes are not in correct place (central) (0).

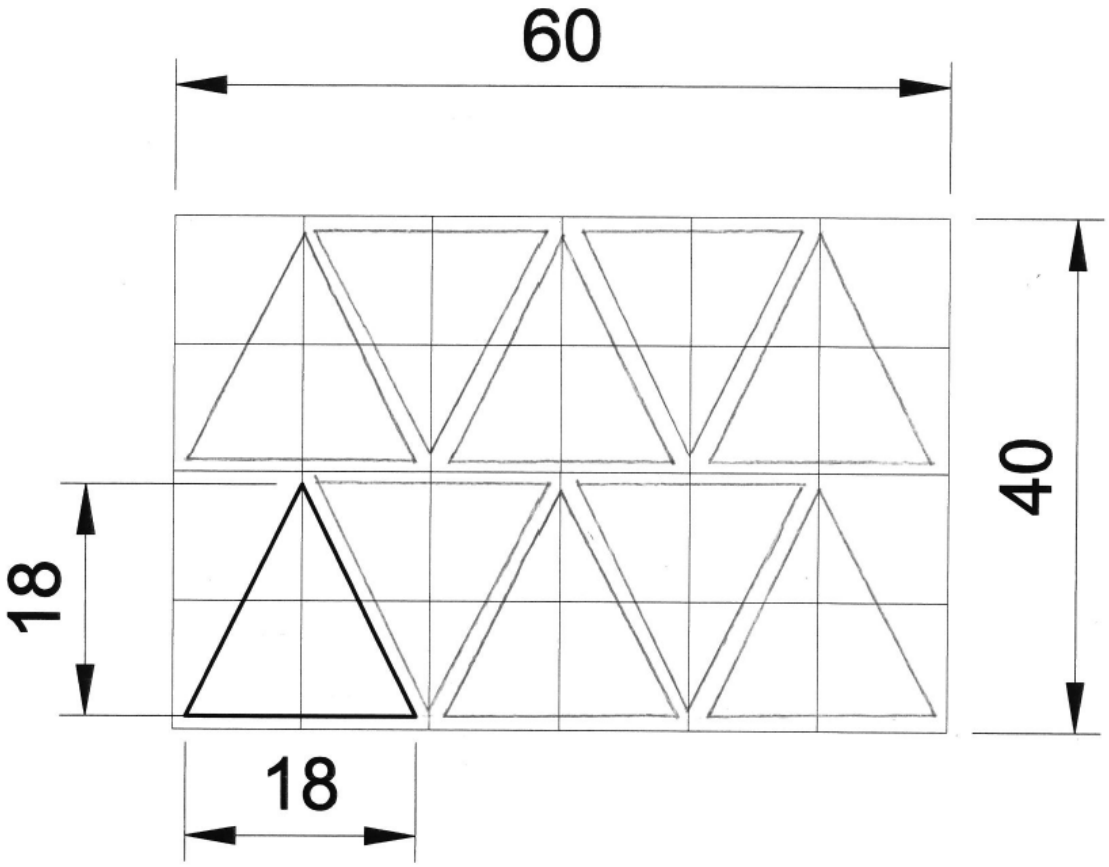
Total: [4 marks]

25 . 1 When packaging is cut out 'nesting' is used to ensure that minimal material is wasted.

A piece of material measures 60mm by 40mm. A triangle pattern measures 18mm (height) by 18mm (base).

The first triangle has been placed on the material. Repeat the triangle pattern to ensure that as many as possible fit on the material.

[1 mark]



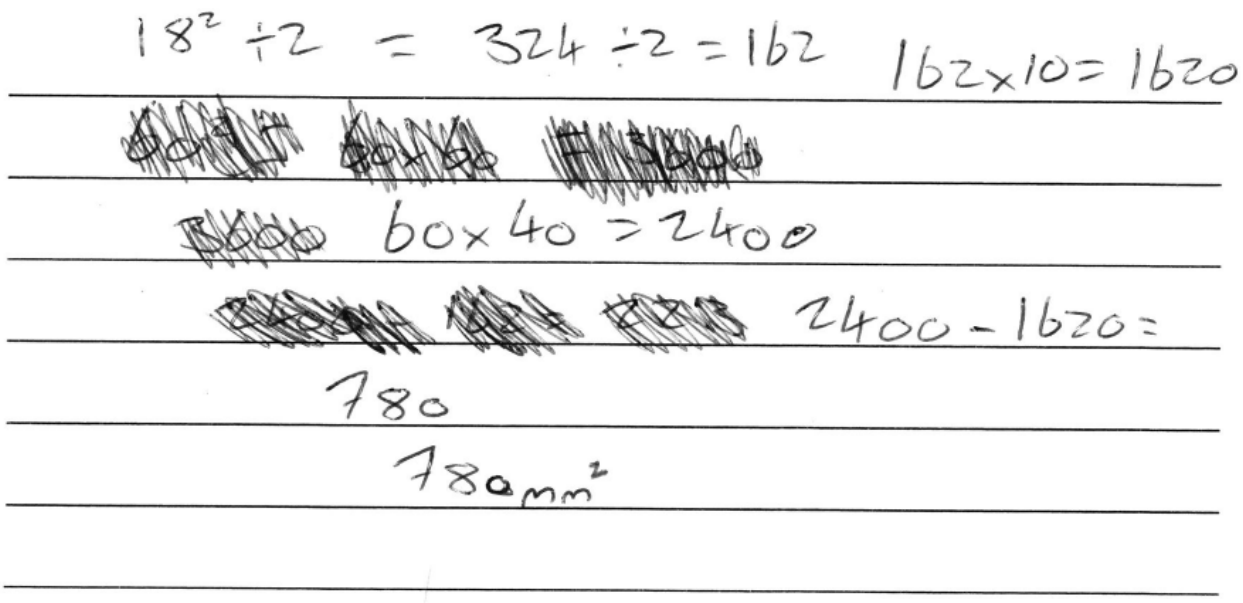
Ten triangles are clearly shown fitting on the grid (1).

Total: [1 mark]

25 . 2 Calculate the amount of material wasted when producing the shapes you have drawn in **Question 25.1**.

Assume no material is wasted when cutting.

[3 marks]



Area of rectangle correctly calculated at 2400 (1).
Area of triangle correctly calculated at 162 (1).
Wastage correctly calculated at 780 mm^2 (1).

[3 marks]

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