

Design technology
Standard level
Paper 1

Thursday 11 May 2017 (afternoon)

45 minutes

Instructions to candidates

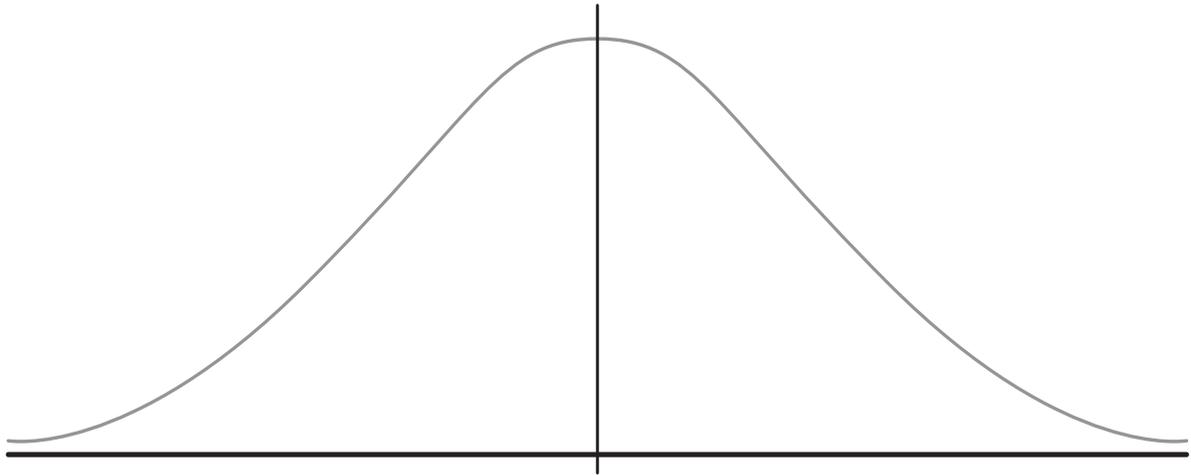
- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is **[30 marks]**.

1. A designer is developing the interior of a car and wants to ensure that the driver has sufficient range of movement to reach all the controls.

What type of data does the designer need?

- A. Dynamic data
 - B. Static data
 - C. Primary data
 - D. Environmental data
2. **Figure 1** below is a bell shaped curve showing a normal distribution.

Figure 1: A bell shaped curve



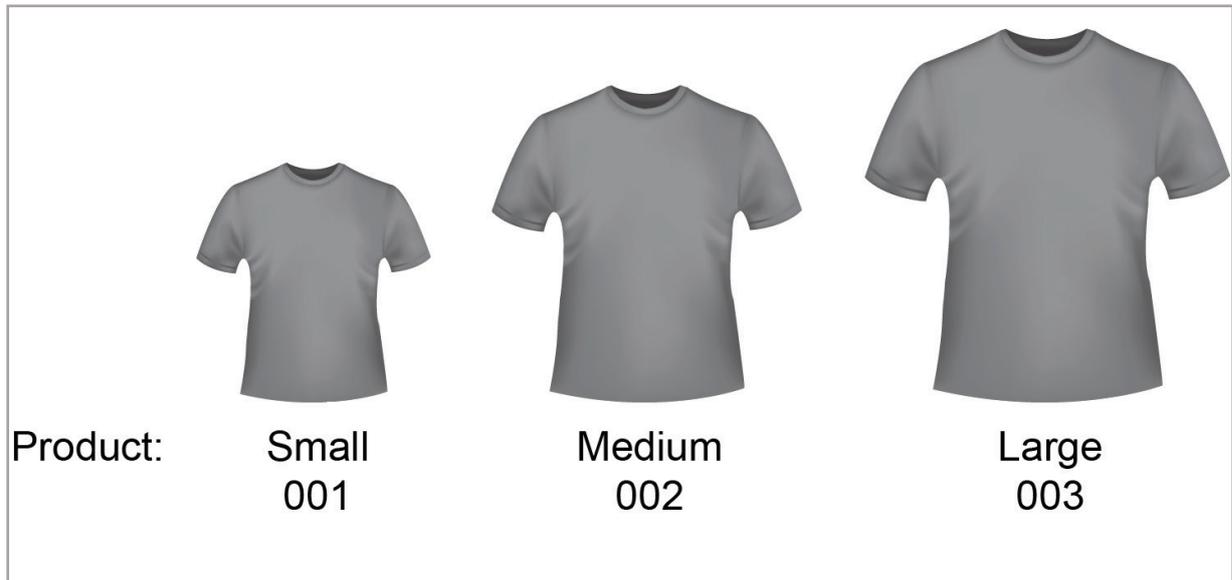
[Source: Generic diagram]

Which strategy should the designer use for the mass-produced product?

- A. 1st – 99th percentile
- B. 95th percentile
- C. 50th percentile
- D. 5th – 95th percentile

3. **Figure 2** below shows a range of t-shirt sizes.

Figure 2: A range of t-shirt sizes



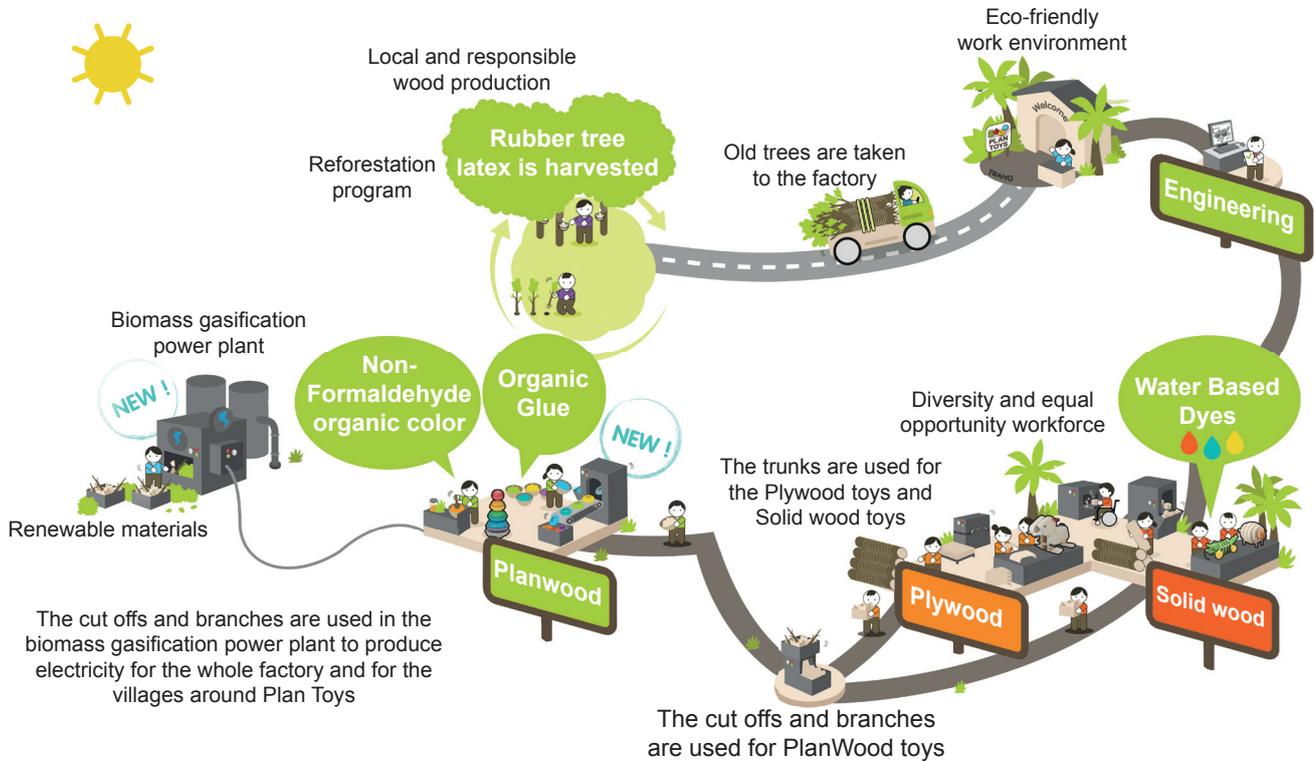
[Source: © International Baccalaureate Organization 2017]

Which scale is used to describe the sizes?

- A. Ratio scale
- B. Interval scale
- C. Nominal scale
- D. Ordinal scale

4. Plan Toys is a company that markets itself on its environmental credentials. **Figure 3** below shows their production and distribution process. What best describes the company's sustainability strategy?

Figure 3: The production and distribution process for Plan Toys



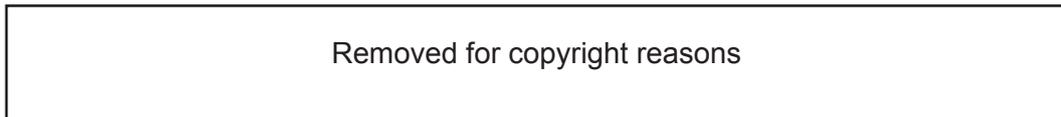
[Source: www.playtravellife.com]

- A. The use of renewable resources
 - B. The promotion of recycling
 - C. Undertaking dematerialization
 - D. The use of product recovery
5. What describes the quantity of material that is ready and available for production?

	Reserve	Resource
A.	No	No
B.	No	Yes
C.	Yes	No
D.	Yes	Yes

6. What is a definition of re-use?
- A. Changing waste material into a new product
 - B. Application of a product in the same or different context
 - C. The reconstruction or renewal of any part of a product
 - D. The return of a product to working order
7. Unilever recently redesigned the packaging of their deodorants, see **Figure 4** below, reducing both the amount of packaging material and the amount of gas used.

Figure 4: Compressed gas packaging

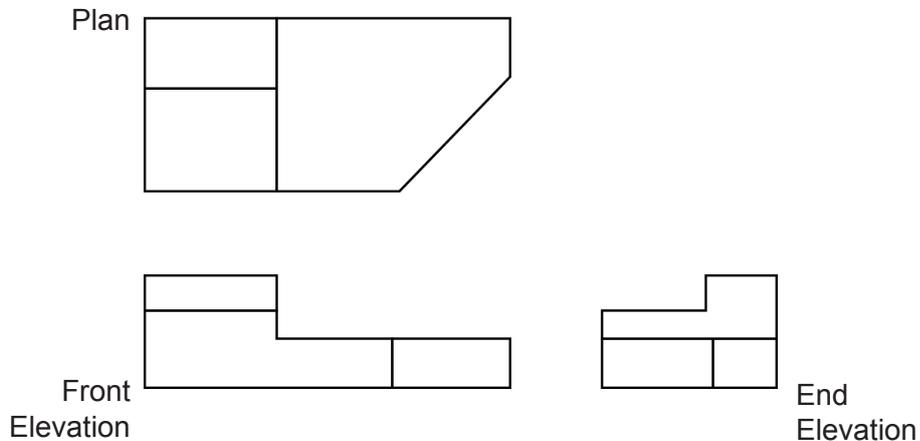


What is the environmental impact of this particular dematerialisation strategy?

- I. Reduced waste
 - II. Reduced material usage
 - III. Reduction in energy consumed
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

8. Which battery type is considered to be non-hazardous by most governments?
- A. Lead acid
 - B. Lithium ion
 - C. Button / coin batteries
 - D. NiCd
9. What is an advantage of incremental design?
- A. No need to invest in large operational changes
 - B. Benefits from patenting new solutions
 - C. Provides competitive advantage by being first to market
 - D. Provides a response to a significant change in legislation
10. **Figure 5** shows a technical drawing of a simple part.

Figure 5: A technical drawing of a simple part



[Source: © International Baccalaureate Organization 2017]

What is the drawing style in **Figure 5**?

- A. Orthographic projection
- B. One-point perspective
- C. Exploded view
- D. Isometric

11. During the development of an electronic product, a designer builds a model that gathers data relating to button presses.

What type of model has been created?

- A. An aesthetic model
 - B. A mock-up
 - C. An instrumented model
 - D. A conceptual model
12. What is an advantage of Finite Element Analysis (FEA)?
- A. It provides an interface with the user via the sense of touch
 - B. It provides feedback on the layout and mapping of controls
 - C. It tests the interaction and interface between parts
 - D. It tests the performance of complex parts
13. What is a potential disadvantage of rapid prototyping?
- A. Production material performance can rarely be simulated
 - B. Development time is usually increased
 - C. Model will not accurately portray production geometry
 - D. Model costs usually adversely affect overall development costs

14. The glass face of a watch shown in **Figure 6** needs to be hard-wearing and scratch resistant.

Figure 6: A watch with a glass face



[Source: https://en.wikipedia.org/wiki/Watch#/media/File:Swatch_Irony_Charcoal_Suit.jpg, by BastienM]

What best describes a material with such properties?

- A. Low stiffness
- B. High hardness
- C. Low tensile strength
- D. High compressive strength

15. A mechanical arm that can make precise motions at high speed belongs to which generation of robots?
- A. First generation
 - B. Second generation
 - C. Third generation
 - D. Fourth generation
16. What is an advantage of man-made timber over natural timber?
- A. High tensile strength with resistance to damp environments
 - B. A renewable source of material
 - C. The creation of large sheets of consistent quality
 - D. Can be recycled more easily
17. Which of the following considers materials, production, assembly and disassembly?
- A. Mass production
 - B. Design for manufacture (DfM)
 - C. Assembly line production
 - D. Computer numeric control (CNC)
18. Which of the following are characteristics of polyester?
- I. High elasticity
 - II. High durability
 - III. High absorbency
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

- 19.** A designer creates a medical product to sell to 100 hospitals. Which is the best scale of production for this?
- A. Mass production
 - B. Batch production
 - C. One-off
 - D. Mass customization
- 20.** Which of the following are subtractive manufacturing techniques?
- I. Computer numeric control (CNC) machining
 - II. Fused deposition modelling (FDM)
 - III. Milling
- A. I only
 - B. I and III only
 - C. II and III only
 - D. III only
- 21.** What is potentially the major ethical impact of an increase in the use of automation?
- A. Decreased wages
 - B. Increased leisure time
 - C. Increased unemployment
 - D. Decreased manufacturing costs

22. The Apple Watch, see **Figure 7** below, is a product that works with a system to provide its functions. It offers new technology for a watch and is part of a new organizational chain between the watch, an iPhone and the iTunes software.

Figure 7: The Apple Watch

Please go to: https://ssl.apple.com/v/watch/g/images/shared/og_guided_tours.jpg?201511200804

What type of innovation is best described by the Apple Watch system?

- A. Configurational
 - B. Architectural
 - C. Modular
 - D. Technology transfer
23. Which individual is more likely to finance the development of a product?
- A. An inventor
 - B. A product champion
 - C. An entrepreneur
 - D. A designer

24. Pixar’s decision to animate the Anglepoise lamp, shown in **Figure 8** below, is an indicator of the lamp’s classic design status.

Figure 8: The Anglepoise lamp

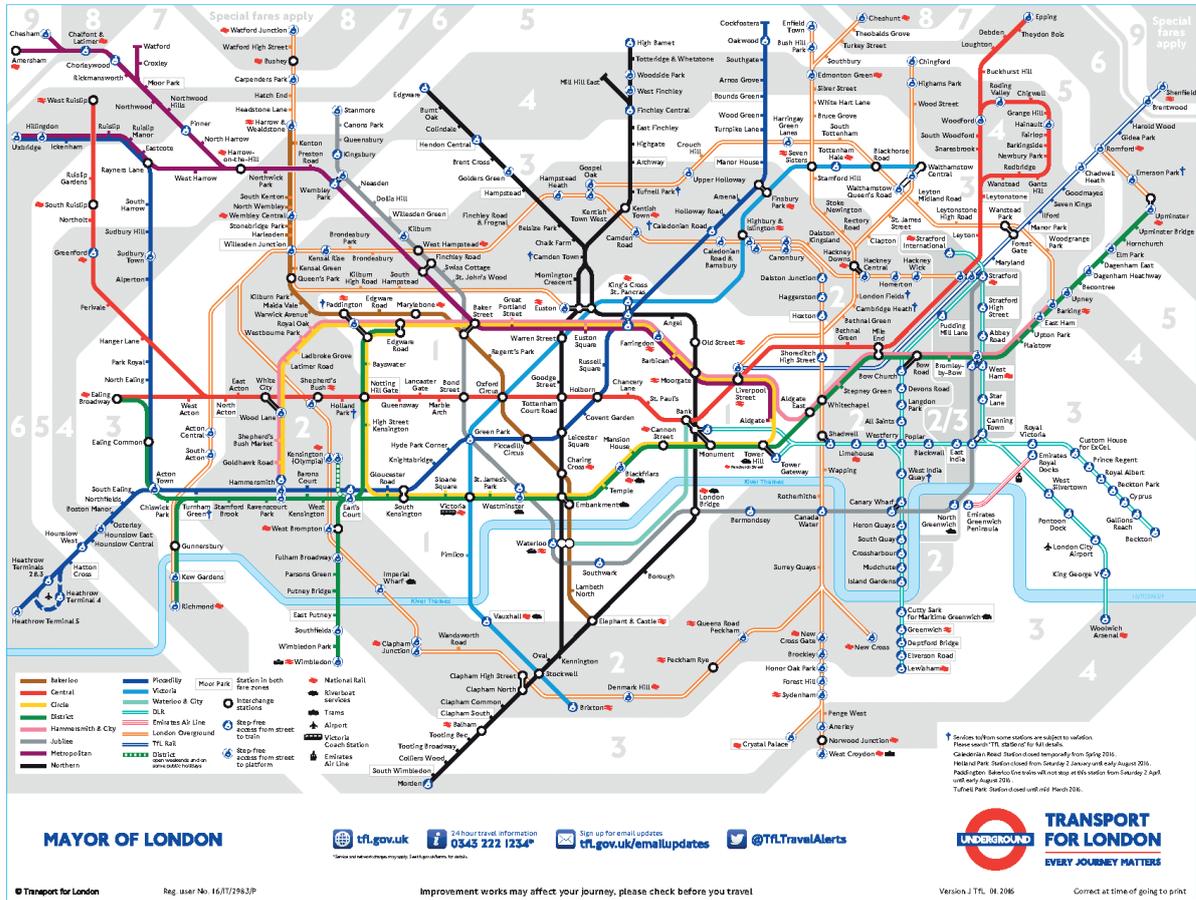


Which of the following is an indicator of classic design status?

- I. No longer produced
 - II. Timeless appeal
 - III. Widely imitated
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

25. Figure 9 below shows a map of the London Underground (Metro). This style of map has been adopted by other cities to represent their metro systems.

Figure 9: The London Underground map



[Source: Registered user number 17/E/3202/P]

What characteristic of classic design best describes the adoption of this style of map by other cities?

- A. Ubiquitous
- B. Innovative
- C. Dominant
- D. Functional

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26. **Figure 10** below is a photo of Cité Radieuse by Le Corbusier, who described his buildings as machines for living.

Figure 10: The Cité Radieuse by Le Corbusier

Please go to: https://upload.wikimedia.org/wikipedia/fr/1/1e/Marseille_la_terrasse_de_la_cit%C3%A9_radieuse.jpg

What design principle best describes Le Corbusier's approach?

- A. Form follows function
- B. Retro styling
- C. Psychological function
- D. Dominant design

Questions 27–30 relate to the following case study. Please read the case study carefully and answer the questions.

Design consultants Teague and Sizemore worked together to create the Denny Bike, an urban bike with auto-shifting, electric assist, smart lighting and an integrated lock, see **Figure 11** and **Figure 12**. The bike was created in response to a competition from a manufacturer to create a new and innovative product. Taking into account the environment that the bike will be used in, the designers will have had to carefully consider what materials and production processes to use. Through assessing the needs of potential users in this environment, the team has incorporated both radical and incremental developments within the overall product.

Figure 11: The Denny Bike



[Source: TEAGUE]

Figure 12: The handlebars on the Denny Bike



[Source: TEAGUE]

27. Which function of the Denny Bike addresses the physiological factors of comfort and fatigue?
- A. Auto-shift
 - B. Electric assist
 - C. Smart lighting
 - D. Integrated lock
28. For maximum strength to weight ratio, the Denny Bike frame is made from composite material. What is not a composite?
- A. Plywood
 - B. Acrylonitrile butadiene styrene (ABS)
 - C. Laminated veneer lumber (LVL)
 - D. Carbon fibre reinforced polymer (CFRP)

Turn over

- 29.** What part of the Denny Bike best meets the definition of radical innovation?
- A. Handlebars
 - B. Chain
 - C. Frame
 - D. Carrier
- 30.** Which symbol represents the most suitable protection for the brand of the Denny Bike?
- A. ©
 - B. ®
 - C. TM
 - D. SM
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