

WEDNESDAY 7th FEBRUARY 2024 - AFTERNOON
DURATION - 2 HOURS, 10 MINUTES
(to include 10 minutes reading time)

INSTRUCTIONS TO CANDIDATES

You are required to answer **ONE** question from Section A
and **ONE** question from Section B.

In **Section A** you are asked to provide **THREE** initial solutions to a problem.
You will be marked on the following:

	Mark
a) Quality of your THREE solutions – how well you solve the problem along with the flair and imagination of your ideas.	30
b) Technical knowledge & the reasoning of your solutions, with operating principals explained and justified.	15
SECTION A TOTAL	45

In **Section B** you are asked to solve a more focused problem, providing only **ONE** detailed solution.

You will be marked on the following:

	Mark
a) The functionality of your given solution – how well it may work.	30
b) The explanation of your solution - your design decisions explained and justified. For questions 4 and 5 your explanation should focus on the choice of materials, components and the method of construction .	15
SECTION B TOTAL	45

Communication including diagrams & designs, annotations and readability	10
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TOTAL	100
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Please fill in the information box at the bottom of each answer sheet with:

- ◆ Your candidate name and school name clearly printed on each sheet.
- ◆ The number of the question you have chosen to answer.
- ◆ The page number.

Please start each question on a fresh sheet of paper

Applicants must not discuss the exam on social media or in any other way

DO NOT TURN THE PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

Section A – Suggested time 1 hour

OPEN-ENDED QUESTIONS

In this section you will be assessed on your ability to solve the problem set in a **CREATIVE AND INNOVATIVE** way, by providing initial concepts.

Answer **ONE** question only from the following **THREE** questions.

Within your chosen question, you must provide three distinctly different solutions.

Question 1

A primary school wants to encourage fitness and hand-eye coordination amongst its pupils.

They want a playground ‘ball target’ that, when a child successfully throws a tennis ball through a hole in the target, returns the ball in three different and creative ways.

Mains electricity is available in the playground.



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Question 2

A large manufacturer of children’s toys wants to develop a new range of toys which focuses on engineering principles.

Design three creative and different educational toys which focus on engineering principles. Each different design should focus on one of the following: Levers; Gears; Cams; Pulleys.

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Question 3

Electric scooters are becoming more and more popular.

Design three different scooter security devices.

The devices will be located outside of buildings such as shops and sports centres and should be designed to take up to a maximum of four scooters.



End of Section A

Section B – Suggested time 1 hour

FOCUSED QUESTIONS

In this section you will be assessed on your ability to present ONE DETAILED TECHNICAL SOLUTION to the given problem focusing on functionality, components, materials and construction.

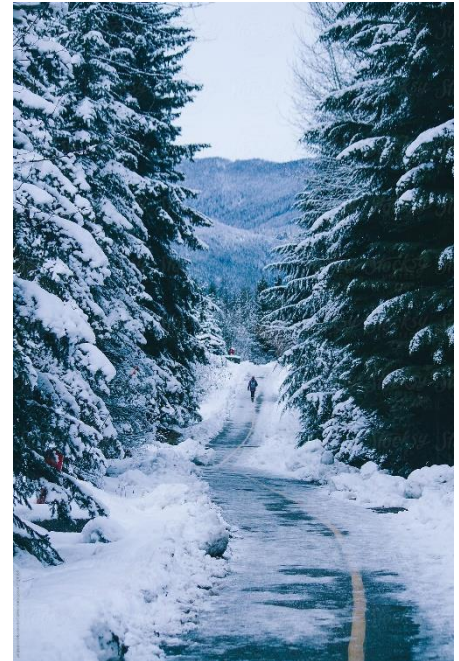
Answer ONE question only from the following THREE questions.

Question 4

In recent years, many parts of the UK have been hit by snow and blizzards.

Gritting lorries are used to clear major routes. However, side roads, lanes and drives are often left untreated.

Design a hand-operated, push-along mechanical grit spreader.



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Question 5

A manufacturer of gaming chairs wants to extend their range of products by designing and producing a new 'dynamic' and interactive chair.

As a member of the company's design team, you are given the task of designing this chair.

An existing seat, pictured, which has a tubular steel framework, must be mounted on or in a device that will make the chair rock from side to side and backwards and forwards as a response to inputs from a connected gaming console.

You do not need to design the interface.



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Question 6

A school canteen plans to introduce a new automated drinks dispenser. The machine will dispense the chosen juice at the press of a button. You have been asked to design the software for this machine.

In order to develop a coded solution, you should design the overall flowchart which will:

- Allow the student to select between two different flavoured drinks;
- monitor if a cup has been inserted before dispensing;
- only dispense the drink when a button is pressed, and a cup is in place;
- stop dispensing the drink when the cup is removed;
- record and display on a screen how many drinks of each flavour have been dispensed during the day (the count is reset at the start of each day);
- indicate when a flavour becomes unavailable by turning on a light at the top of the machine

You should use subroutines to perform specific tasks, to make the program easier to test, and avoid reference to specific software packages or hardware. You do not need to produce the coded solution.

Before designing your flowchart, and to make sure you fully understand the problem, you should outline your thought process by:

- Defining the overall problem, and
- Identifying the individual parts of the problem



End of Section B

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Arkwright Engineering Scholarships
The Smallpeice Trust
Holly House
74 Upper Holly Walk
Leamington Spa
Warwickshire
CV32 4JL

01926 333200
arkwright.org.uk

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