



# Report on the Arkwright Aptitude Exam 2020



This was yet another successful exam with markers reporting that communication had improved on previous years, with ideas being well-presented through annotated 3D sketches, and operating principles often being well explained. It was, in many instances, easy to follow the candidate's 'engineering thinking'. However, some candidates still presented work which was challenging to assess, and centres are asked to ensure students understand the importance of presenting work which is easily understood by a third party.

It was clear once again that many candidates failed to read or fully understand the nature of the problem being set in the questions: this often resulted in answers that failed to address key aspects of the question. It was felt that some candidates lacked the detailed knowledge of how things work and a basic understanding of engineering principles as some solutions clearly lacked insight.

There are still a very small number of centres that continue to use an out-of-date version of the A3 answer sheet which display the incorrect mark scheme. Centres are encouraged to follow the exam instructions and always download the latest version of the A3 answer sheet.

## Section A

Most candidates were able to provide two working solutions to the problems set but occasionally failed to produce a third solution which was significantly different to the first two. Creativity was shown in response to questions in this section with a few candidates producing very good answers. However, other candidates provided solutions that either lacked practicality or failed to answer key aspects of the question. Candidates are urged to read their chosen question thoroughly to understand the key requirements before embarking on their answers.

### Question 1

There was a wide range of solutions such as indicators, automatic night-lights, crash detection and positioning, heating and cooling systems and air bags. However, not all solutions used wearable textiles or focused on the safety aspect for the cyclist: for example, some responses had shown the equipment mounted on the bike frame. Many candidates included relevant electronic components but too few had indicated the circuitry needed to operate the device.

### Question 2

Some candidates produced a wide range of imaginative solutions and the better ones incorporated the interactivity that was the key element of the question. Some solutions showed very large installations that demonstrated little engineering knowledge and operating principles. Water management, for instance was not always well-thought-through. The markers often struggled to understand the scale of the proposal as many solutions did not include reference to the people interacting with the device.

### Question 3

This question was the least popular in section A, and had the weakest responses, with many candidates failing to address the 'sensory' elements. Many answers focused more on social skills rather than the special needs requirement.



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## Section B

We were pleased to see strong improvement in the detailed knowledge of engineering principals displayed by many candidates. Better responses included annotated sketches of the complete solution with exploded views of sub-systems and the inclusion of flow diagrams to explain how it would work.

### Question 4

Most candidates successfully produced a human-powered solution appropriate for the developing world. Better responses made use of local materials and widely available technologies/components such as would be found on a bike - for example a chain and sprocket. Lower achieving candidates failed to appreciate the low-volume scale of the process, sometimes including the use of conveyor belts and other impractically large machinery.

### Question 5

Responses to this question varied. Many candidates focused on attaching the dispenser to the bike, but few showed enough detail of how the distance between flour drops would be measured (including which sensor might be used) and/or how the flour would be released. It was good to see some candidates refer to the wheel circumference with calculations regarding distance covered. Very many candidates provided solutions that would appear to dispense a very high volume of flour.

### Question 6

This question allowed many candidates to explore a variety of mechanical solutions, including rack and pinion, pneumatic and hydraulic systems and compound gear trains. However, some candidates over-complicated their solution, or failed to consider a power source, such as a pump to provide hydraulic power, or an electric motor to provide lift. The inclusion here of flow charts, and even coding, gained many candidates extra marks.