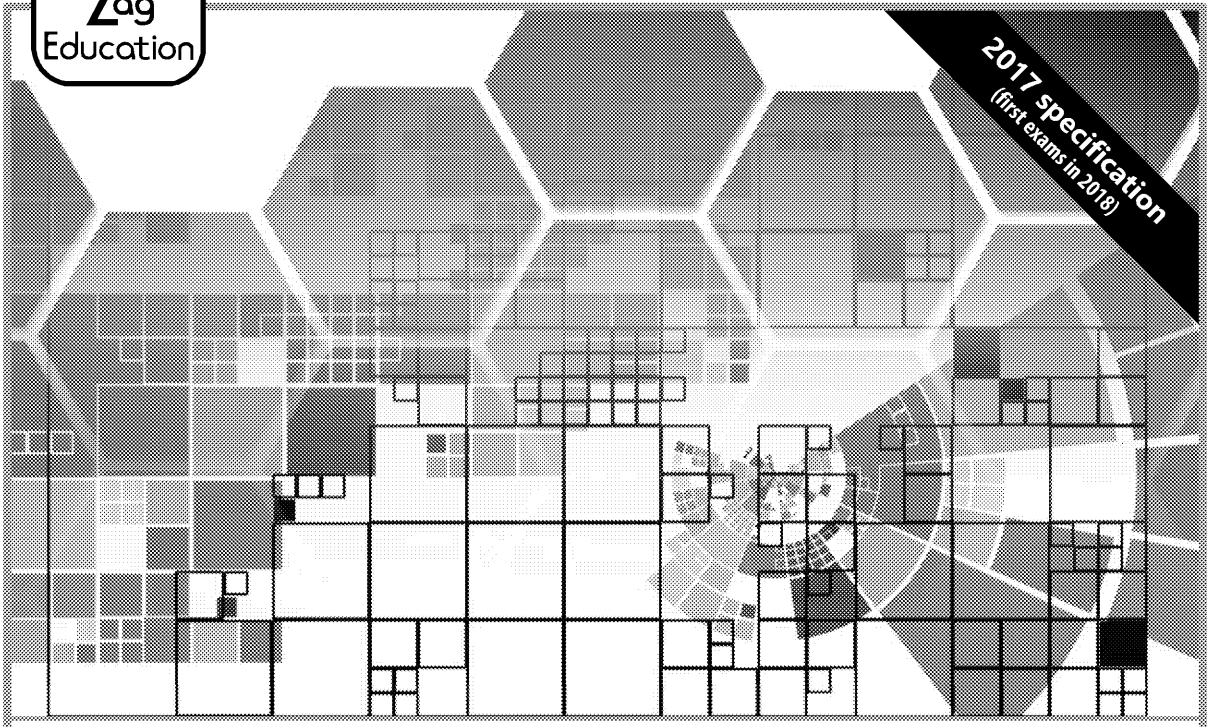
Zig Zag Education

Maths **AS / A Level | Edexcel | 8MA0/9MA0**



Topic Tests: Challenge Tests – Set B

For AS / A Level Year 1 Edexcel Statistics and Mechanics

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POD 8662

Contents

Teacher's Introduction

Content

This pack contains 9 challenge level topic tests and solutions for the Edexcel Applied Mathematics AS / Year 1 A Level content.

Each test comes with fully worked solutions, containing helpful tips, hints, and technique boxes for students who are struggling on a particular question.

These topic tests have been **fully cross-referenced** to the Pearson, Hodder and Collins textbooks for your convenience (see reference sheet on page 2). Each test has been designed to reflect the specification fully.

About the challenge tests

These **challenge** tests have been designed to **stretch and challenge** your students. 50% of the marks come from questions similar in style to our fundamentals tests. These questions isolate and test the core skills in each topic. The other 50% of the marks come from questions of increased difficulty that progress and start to combine the concepts in the topic.

Suggested use of the A and B tests

Each test in Set A has a corresponding test in Set B that features the same styles of questions but with different numbers. This allows for a variety of **flexible** uses including:

- **Test → Homework**: Students use test B as a homework to consolidate on areas of weakness identified from completing test A under test conditions in class.
- **Homework → Test**: Students revise as homework using test A before doing test B in class under test conditions.
- **Test → Classwork**: Students work through test B with teacher input to consolidate on areas of weakness identified from completing test A under test conditions in class.

Classwork → Test: Students work through test A with teacher input, before checking their learning by completing test B under test conditions.

Timings

The recommended times for students to complete each test are given at the top of individual tests. Suggested times for our entire range of topic tests are also compiled in a table on the timings sheet for convenience (see page 3). For these fundamentals tests, the relevant times are the first two listed under each topic.

Calculator use

The effective use of a calculator is one of the objectives of the new specification and is encouraged for all the enclosed tests. In particular, students should be comfortable using the statistical functions on their calculator.

The large data set

As part of their assessment, students will be tested on data from the **large data set** provided by Edexcel. This data set contains meteorological data from various locations and time periods. Familiarity with the large data set is assumed in these topic tests, but a copy of it is not needed to take the tests themselves.

Also available from ZigZag Education

The perfect starting point for students of all abilities are our **fundamentals** tests. These isolate and test the core skills in each topic so that your students can show what they can do. They get a confidence boost and you can see at a glance where each student's weaknesses lie.

To prepare students for the exam itself, our **expert** tests contain 25% repeated marks from the fundamentals and challenge tests, and 75% exam-style material with compound/multistep questions.

Cross-referencing Grid

Topic	Edexcel spec. points	Sub-topics	Edexcel Pearson textbook [ISBN: 9781292232539]
Data Collection	1.1	Populations, samples, sampling, non-random sampling, types of data, the large data set	1
Measures of Location and Spread	2.3	Measures of central tendency, other measures of location, measures of spread, variance and standard deviation, *coding (Edexcel only)*	2
Representations of Data & Correlation	2.1 – 2.2, 2.4	Outliers, box plots, cumulative frequency, histograms, comparing data, correlation, linear regression	3 - 4
Probability	3.1	Calculations, mutually exclusive and independent events, Venn diagrams, tree diagrams	5
Statistical distributions	4.1	Probability distributions, binomial distribution, cumulative probabilities	6
Hypothesis testing	5.1 – 5.2	Hypothesis testing, finding critical values, one-tailed tests, two-tailed tests	7
Constant Acceleration	7.1 – 7.3, 8.3	Displacement-time graphs, velocity-time graphs, constant acceleration formulae, vertical motion under gravity	9
Modelling in Mechanics & Forces and Motion	6.1, 8.1 – 8.4	Force diagrams, forces as vectors, forces and acceleration, motion in 2 dimensions, connected particles, pulleys	8, 10
Variable Acceleration	7.4	Functions of time, using differentiation, maxima and minima problems, using integration, constant acceleration formulae	11

Timings Sheet

For the **fundamentals** tests, refer to the tests marked X.1a and X.1b.
For the **challenge** tests, refer to the tests marked X.2a and X.2b.
For the **expert** tests, refer to the tests marked X.3a and X.3b.

Topic test reference	Recommended time (minutes)	Topic test reference	Recommended time (minutes)	
Data Collection		**Probability**		
1.1.a	12	4.1a	30	
1.1b	12	4.1b	30	
1.2a	9	4.2a	26	
1.2b	10	4.2b	26	
1.3a	1	4.3a	32	
1.3b	12	4.3b	32	
Measures of Location and Spread		**Statistical Distributions**		**Mo**
2.1a	28	5.1a	24	
2.1b	28	5.1b	24	
2.2a	31	5.2a	24	
2.2b	30	5.2b	24	
2.3a	34	5.3a	31	
2.3b	32	5.3b	31	
Representations of Data & Correlation		**Hypothesis Testing**		
3.1a	16	6.1a	17	
3.1b	16	6.1b	17	
3.2a	19	6.2a	17	
3.2b	19	6.2b	17	
3.3a	22	6.3a	17	
3.3b	22	6.3b	17	

Constant Acceleration – Test B (15 mins)

Subtopics: Displacement–time graphs, velocity–time graphs, constant acceleration form
For this test you should take g = 9.8 m s^{-2} unless otherwise stated and give your ans

1. The diagram shows the displacement–time graph for a rabbit running i straight line. Find:
   a) The **displacement** of the rabbit from its starting position after 10 seconds
   b) The average **velocity** of the rabbit in the first 4 seconds

2. The diagram shows the displacement–time graph for a van travelling a
   a) State the **displacement** of the van after 10 seconds.
   b) Find the **distance travelled** by the van in the 10 seconds.
   c) Find the average **velocity** of the van during these 10 seconds.
   d) Find the average **speed** of the van during these 10 seconds.

3. A particle moves along a straight line. The particle accelerates uniform velocity m s^{-1} in 10 seconds. It then moves at a constant velocity then takes 6 seconds to decelerate uniformly to rest at point *B*.
   a) Sketch a **velocity–time graph** to illustrate the motion of the partic
   b) Find the **distance from *A* to *B***.

4. A plane travels along a straight horizontal runway. The plane accelera acceleration 4 m s^{-2} for a distance of 1.25 km before it takes off. Find reaches the point of take-off.

5. A pebble is dropped from a clifftop 50 m above the ground. Modelling moving freely under gravity with initial velocity 0 m s^{-1}, find the **time** ground.

6. The diagram shows the velocity–time graph for a bus travelling along a straight road between two sets of traffic lights. Find:
   a) The acceleration of the bus during the **final 10 seconds** of travel **[1]**
   b) The **total distance travelled** by the bus during these 60 seconds **[2]**

7. A particle is moving in a straight line with constant acceleration 1.5 m velocity u m s^{-1} at $t = 0$ s. It passes point *B* with velocity $v = 15$ m s^{-1}
   a) The **velocity**, u m s^{-1}, of the particle when it passed point *A*
   b) The **distance from *A* to *B***

8. Benji projects a ball vertically from point *A* with velocity 7 m ground. Find:
   a) The time for the ball to reach its **greatest** height above po
   b) The of the ball when it hits the ground

9. Vivien skims a stone horizontally across a frozen lake with initial velo **decelerates** constantly at a rate of 2 m s^{-2}. Find:
   a) The **displacement** of the stone from Vivien when it comes to a st
   b) The **time taken** for the stone to come to a stop

10. Given $v = u + at$ and $s = \left(\frac{u+v}{2}\right)t$, show that $v^2 = u^2 + 2as$

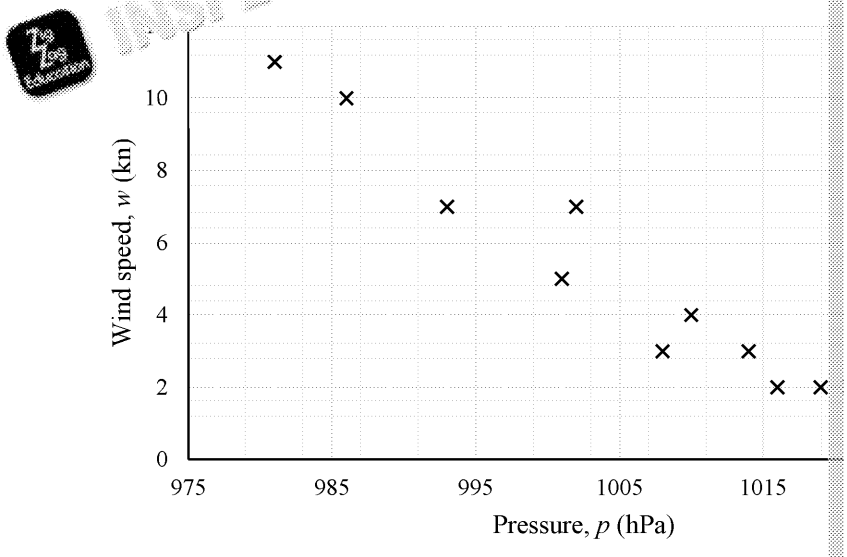
Preview of Questions Ends Here

Solutions to Representations of Data and Correlation – Test B

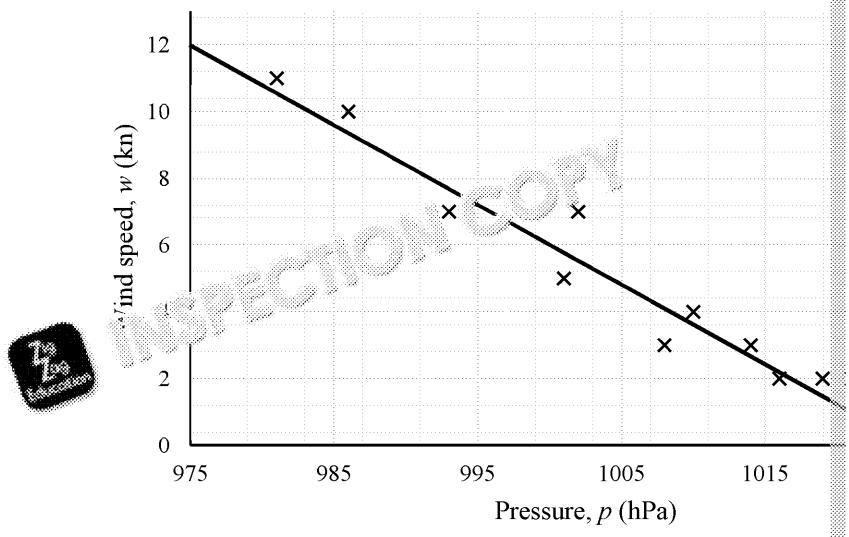
1. a) Median = 75 **A1**
   b) Lower quartile = 68, Upper quartile = 80 **M1**
   Interquartile range = 80 – 68 = 12 **A1**
   c) Maximum = 85, minimum = 45 **M1**
   Range = 85 – 45 = 40 **A1**

2. Interquartile range = 153 – 134 = 19 g **M1**
   1.75 × Interquartile range = 1.75 × 19 = 33.25 g
   Outliers are either: greater than 153 + 33.25 = 186.25 g
   OR less than 134 – 33.25 = 100.75 g **M1**
   So the only outlier is 100 g **A1**

3. a) Pressure on the horizontal axis, wi[illegible] vertical axis **M1**
   At least nine points plotted [illegible] **A1**
   Completely correct [illegible] data points marked with crosses and axes labelled



   b) There is strong, negative correlation. **A1**
   c) Line with gradient –0.24 **A1**
   Line that intercepts the vertical axis at (975, 12) (see below)
   (also accept a correct intercept for a line that extends for at least $981 \leq p \leq 1023$



   d) If the pressure is 1 hPa higher on a certain day then the wind speed will be appr[illegible] other appropriate ratio of wind speed to pressure). **A1**

4. a) Area of sixth bar is $0.5 \times 10 = 5$, so frequency of class is equal to area of bar **M**
$0.3 \times (40 - 30) = 3$ times **A1**

b) Number of journeys between 20 minutes and 45 minutes is approximately the a
45 **M1**
Area $= 0.1 \times (30 - 20) + 0.3 \times (40 - 30) + 1.0 \times (45 - 40) = 1 + 3 + 5 = 9$ times

c) The actual number of journeys Victoria took that were between 20 and 30 minu
assumed that the journey times are evenly distributed in this interval **A1**

Preview of Answers Ends Here