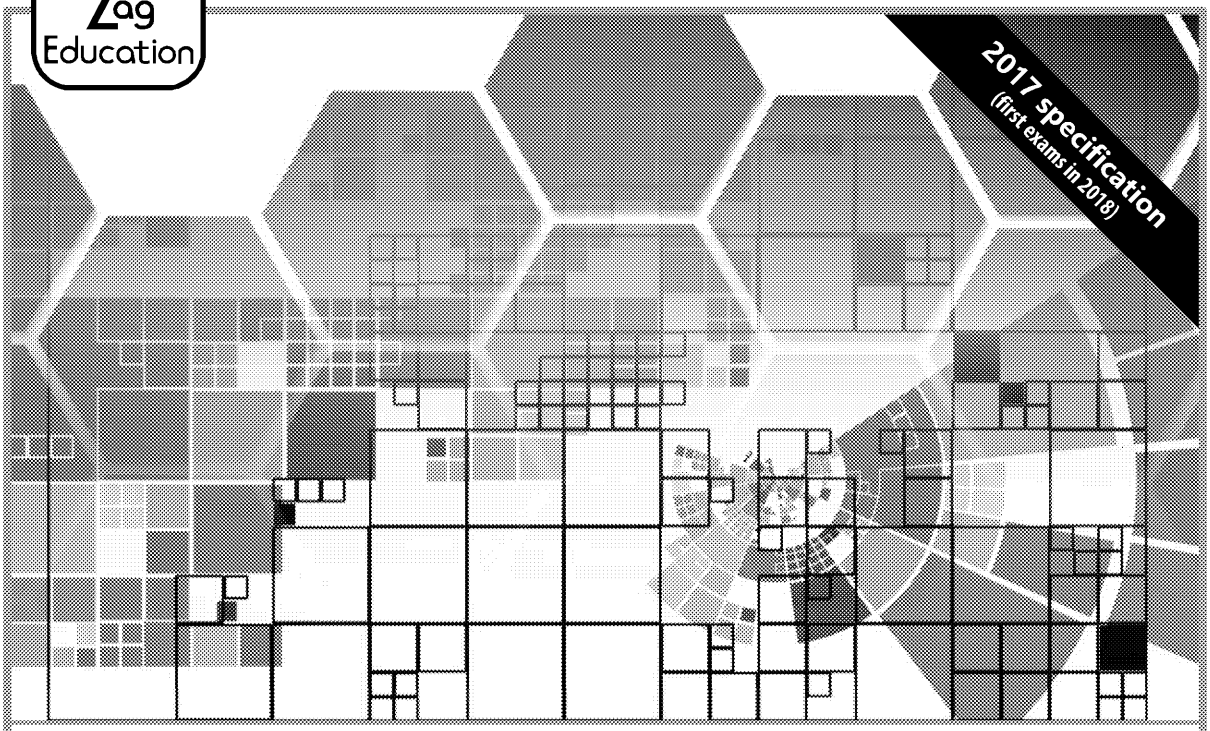
Zig Zag Education

Maths **AS / A Level | OCR A | H230/H240**



Topic Tests: Fundamentals Tests – Set A

For AS / A Level Year 1 OCR A Statistics and Mechanics

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Contents

Teacher's Introduction

Content

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

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 fundamentals tests

These **fundamentals** tests focus on isolating and testing the core skills of each topic. The questions are designed to use simple numbers and contexts **so that students can show what they can do,** and to allow them to easily identify any weaknesses.

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

Timings

The recommended times for students to complete each test are given at the top of individual tests.

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 OCR. This data set contains data on workers' commutes and the age structure of the England & Wales population from two years in various locations. 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

For students who are ready to go beyond the fundamentals, a complete set of **challenge** tests are available. 50% of the marks in these tests come from concepts covered in the fundamentals tests in order to reinforce learning and boost students' confidence, while the other 50% increases in difficulty and progresses the concepts covered.

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.

For each collection of Set A tests we also offer a corresponding collection of Set B duplicated tests with the same styles of questions but 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.

For total flexibility, the Set A and Set B tests of all three levels can be run on a rolling basis, using the fundamentals tests as starters, with a time interval between them, leaving one expert level test to use at the end of the course for topic revision.

Cross-referencing Grid

Topic	OCR A spec. points	Sub-topics	Edexcel Pearson textbook [ISBN: 9781292232539]
Data Collection	2.01a – d	Populations, samples, sampling, non-random sampling, types of data, the large data set	1
Measures of Location and Spread	2.02f – g	Measures of central tendency, other measures of location, measures of spread, variance and standard deviation, *coding (Edexcel only)*	2
Representations of Data & Correlation	2.02a – e, 2.02h – j	Outliers, box plots, cumulative frequency, histograms, comparing data, correlation, linear regression	3 - 4
Probability	2.03a – b	Calculations, mutually exclusive and independent events, Venn diagrams, tree diagrams	5
Statistical distributions	2.04a – c	Probability distributions, binomial distribution, cumulative probabilities	6
Hypothesis testing	2.05a – c	Hypothesis testing, finding critical values, one-tailed tests, two-tailed tests	7
Constant Acceleration	3.02a – d, 3.03f	Displacement-time graphs, velocity-time graphs, constant acceleration formulae, vertical motion under gravity	9
Modelling in Mechanics & Forces and Motion	3.01a – b, 3.03a – d, 3.03f – k, 3.03n, 3.03r	Force diagrams, forces as vectors, forces and acceleration, motion in 2 dimensions, connected particles, pulleys	8, 10
Variable Acceleration	3.02f	Functions of time, using differentiation, maxima and minima problems, using integration, constant acceleration formulae	11

Data Collection – Test A (12 mins)

Subtopics: Populations and samples, sampling, non-random sampling, types o

1. What is a **sampling unit**?

2. What is **stratified sampling**?

3. A teacher wants to take a sample of the students at his school. He sele for the sample.
   a) What **type** of sample has the teacher used?
   b) State one **advantage** and one **disadvantage** of this type of sampli

4. A researcher wants to calculate the percentage of people travelling to w light rail and tram in England and Wales in 2011. He takes a sample c people travelling by subway to work in different districts of London in 2 the largest data set. Explain why this sample may not be representative o travelling to work by underground, metro, light rail and tram in Englan

5. Alex has the following data from the large data set:

Local Authority / Unitary District	Number who trave bus, minibus or co
County Durham	13,732
Darlington	3,380
Gateshead	13,909
Hartlepool	2,556
Middlesbrough	4,868
Newcastle upon Tyne	21,728
North Tyneside	8,606
Northumberland	7,593
Redcar and Cleveland	3,314
South Tyneside	6,194
Stockton-on-Tees	5,023
Sunderland	15,151

   She decides to take a sample of **six** data points from this data using a s
   Alex calculates that she must take every $12 \div 6 = 2$ data points.
   She starts with the first data point and takes every second data point af
   mistake has Alex made with her sample and how should she correct it?

6. Fill in the blanks:
   a) Data associated with non-numerical observations is called _____
   b) A variable that can take any value in a given range is a _____

7. The manager of a supermarket wants to find out what customers think
   a) Give a reason why the manager might not be able to take a **census**
   The manager decides to take a sample.
   b) Suggest which **type** of sampling the manager should use. Give a r

Preview of Questions Ends Here

Solutions to Measures of Location and Spread – Test A

1. a) $\text{Mean} = \dfrac{10.4+13.5+7.8+11.4+9.6+10.5+9.3+18.5+11.4+8.8+10.9}{11}$ **M1**

$= \dfrac{122.1}{11} = 11.1 \text{ cm}$ **A1**

Median = 10.5 cm **A1**

Mode = 11.4 cm **A1**

Range = 18.5 – 7.8 = 10.7 cm **A1**

b) Mean **A1**

Calculation of the mean includes all data points. **A1**

OR

Median **A1**

The median is not affected by extreme value[s] **A1**

2. a) Median = 157 cm **A1**

b) Lower Quartile = [illegible]

Upper Quartile = 162 cm **A1**

c) Interquartile Range = 162 – 153 = 9 cm **M1A1**

Technique: Put the numbers in order. The median is then the (7+1)/2 = 4th value. The lower quartile is the 7/4 = 1.75th value and the upper quartile is the 3 × 7/4 = 5.25th value which rounds up to 6th value.

3. a) $\text{Mean} = \dfrac{39+44+41+57+43+43+45+43+40+41}{10}$

$= \dfrac{436}{10}$

= 43.6 minutes (or 43 minutes and 36 seconds) **M1A1**

b) $\sum x^2 = 39^2 + 44^2 + 41^2 + 57^2 + 43^2 + 43^2 + 45^2 + 43^2 + 40^2 + 41^2$

$= 1521+1936+1681+3249+1849+1849+2025+1849+1600+1681 = 1$

$\text{Standard Deviation} = \sqrt{\dfrac{\sum x^2}{n} - \left(\dfrac{\sum x}{n}\right)^2}$

$\text{Standard Deviation} = \sqrt{\dfrac{19240}{10} - 43.6^2}$

$= \sqrt{23.04}$

= 4.8 minutes (or 4 minutes and 48 seconds) **M1A1**

4. **Method 1:**

Median is (10+1)/2 = 5.5th value so is halfway between 5th and 6th values when the d[ata]

In 2001 this is halfway between 55.3 and 55.8. **M1**

In 2011 this is halfway between 53.8 and 53.9. **M1**

So the median in 2001 is 55.55%. **A1**

55.55 is greater than 53.85 so the median in 2001 is higher, so Harry is incorrect. **A1**

Method 2:

$\text{Mean in 2001} = \dfrac{71.9+51.5+51.0+55.3+56.2+56.[illegible]+55.8+53.3+56.8+55.2}{10}$ **M1**

$= \dfrac{563.5}{10} = 56.[illegible]$ (3 s.f.) **A1**

$\text{Mean in 2011} = \dfrac{50.3+49.7+47.3+56.0+56.4+53.7+53.8+53.9+55.1+52.6}{10}$ **M1**

$= \dfrac{548.8}{10} = 54.88 = 54.9\%$ (3 s.f.) **A1**

56.4 is greater than 54.9 so the mean in 2001 is higher, so Harry is incorrect. **A1**

5. Total score for girls = 24 × 7 = 168 and total score for whole class = 22 × (14 + 7) = 46[illegible]

So total score for boys = 462 – 168 = 294 **M1**

Mean score for boys = 294 ÷ 14 = 21 **A1**

Preview of Answers Ends Here