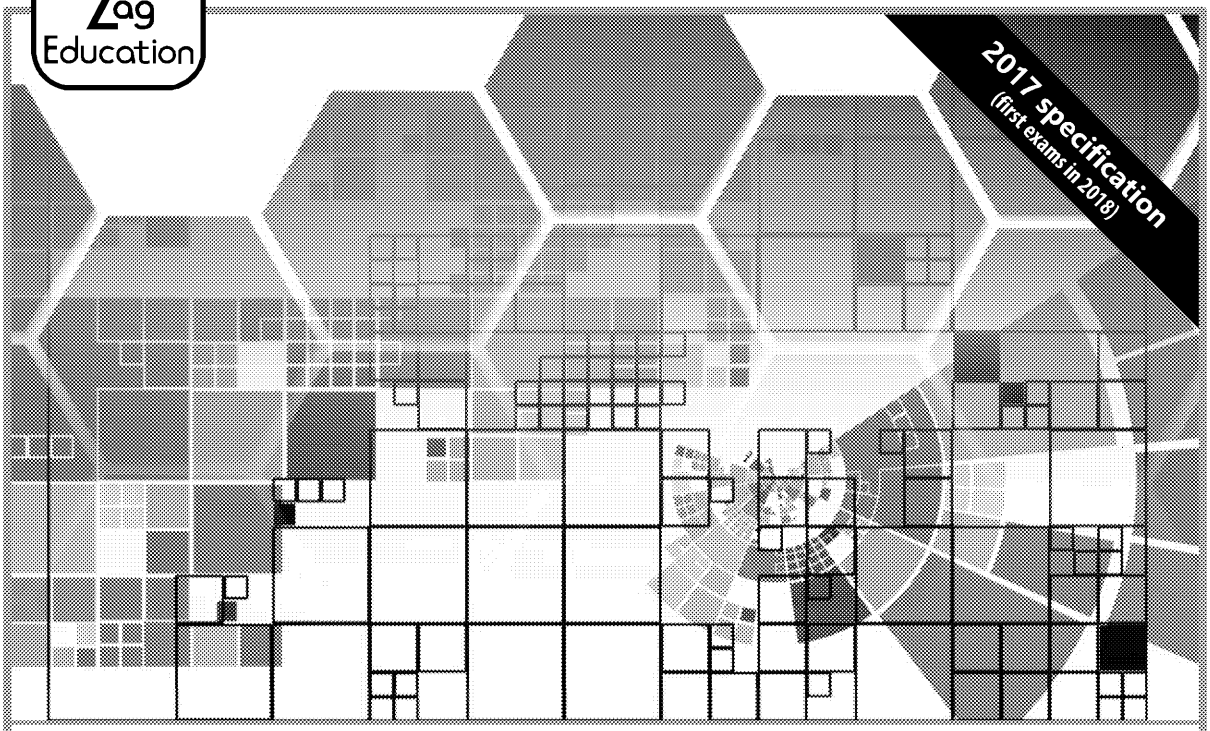
Zig Zag Education

Maths **AS / A Level | AQA | 7356/7357**



Topic Tests: Fundamentals Tests – Set A

For AS / A Level Year 1 AQA Statistics and Mechanics

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POD 8671

Contents

Teacher's Introduction

Content

This pack contains 9 fundamental level topic tests and solutions for the AQA 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. This pack is an updated version of the Applied AS / Year 1 topic tests – the suggested times have been increased to provide students with a more reasonable amount of time to complete each test.

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.

Large data set questions

As part of their assessment, students will be tested on data from a **large data set** provided by AQA. This data set contains data on vehicles registered in various locations in England between 2002 and 2016. These topic tests make use of the original large data set provided by AQA, which contains data on household food and drink purchases; familiarity with these is not assumed and is not needed to take these tests.

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.

Update v1.1, September 2018
Improved and increased suggested times to complete each test. Additionally in answers scale corrected 3.1a Q3, added 'Graph Paper Needed' flag where needed.

Cross-referencing Grid

Topic	AQA spec. points	Sub-topics	Edexcel Pearson textbook [ISBN: 9781292232539]
Data Collection	K1	Populations, samples, sampling, non-random sampling, types of data, the large data set	1
Measures of Location and Spread	L3	Measures of central tendency, other measures of location, measures of spread, variance and standard deviation, *coding (Edexcel only)*	2
Representations of Data & Correlation	L1 – L2, L4	Outliers, box plots, cumulative frequency, histograms, comparing data, correlation, linear regression	3 - 4
Probability	M1	Calculations, mutually exclusive and independent events, Venn diagrams, tree diagrams	5
Statistical distributions	N1	Probability distributions, binomial distribution, cumulative probabilities	6
Hypothesis testing	O1 – O2	Hypothesis testing, finding critical values, one-tailed tests, two-tailed tests	7
Constant Acceleration	Q1 – Q3, R3	Displacement-time graphs, velocity-time graphs, constant acceleration formulae, vertical motion under gravity	9
Modelling in Mechanics & Forces and Motion	P1, R1 – R4	Force diagrams, forces as vectors, forces and acceleration, motion in 2 dimensions, connected particles, pulleys	8, 10
Variable Acceleration	Q4	Functions of time, using differentiation, maxima and minima problems, using integration, constant acceleration formulae	11

Measures of Location and Spread – Test A (28 m

Subtopics: Measures of central tendency, other measures of location, measures of spread, va
In this test you should give your answers to 3 s.f. where app

1. A biologist is investigating the lengths of fish in the pond. He catches
centimetres, are given below:

10.4 13.5 7.8 11.4 9.6 10.5 9.3 18.5 1

a) Calculate the **mean**, **median**, **mode** and **range** of the lengths of th
b) The biologist wants to know the average length of fish in the pond
above should he use? Give a **reason** for your answer.

2. The heights of the seven members of a netball team are given below, c
centimetre:

156 [illegible] 160 153 147 162

a) Find the **median** of the players in the netball team.
b) Calculate the **upper** and **lower quartiles** for the heights of the pla
c) Hence calculate the **interquartile range** of the heights of the playe

3. Grace drives to work every morning for 10 days. The times of the jou
nearest minute, are given below:

39 44 41 57 43 43 45 43

a) Calculate the **mean** time it takes for Grace to get to work during th
b) Calculate the **standard deviation** of the times taken for Grace to g

4. Harry has the following data from the Large Data Set, showing the am
per person per week in the West Midlands and in Yorkshire and the Hu

Year	Marmalade per person per week in West Midlands (g)	Marma week i
2001–02	10	
2002–03	7	
2003–04	8	
2004–05	9	
2005–06	10	
2006	8	
2007	7	
2008	8	

Harry says, 'On average, people in Yorkshire and the Humber bought
than people in the West Midlands did during the recording period.' Is
answer with a calculation.

5. A class of boys and 7 girls sat a maths test. The mean score for the gi
overall score for the whole class was 22 marks. What was the **mean sco**

Preview of Questions Ends Here

Solutions to Constant Acceleration – Test A

1. a) 15 m **A1**

   b) $\text{Average velocity} = \dfrac{\text{Displacement from starting position}}{\text{Time taken}} = \dfrac{10\text{ m}}{5\text{ s}} = 2\text{ m s}^{-1}$ **A1**

2. a) 0 m **A1**

   b) 10 + 10 = 20 m **A1**

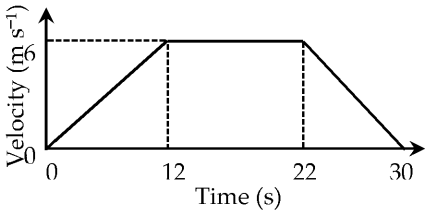
   c) $\text{Average velocity} = \dfrac{\text{Displacement from starting position}}{\text{Time taken}} = \dfrac{0\text{ m}}{10\text{ s}} = 0\text{ m s}^{-1}$ **A1**

   d) $\text{Average speed} = \dfrac{\text{Total distance travelled}}{\text{Time taken}} = \dfrac{20\text{ m}}{10\text{ s}} = 2\text{ m s}^{-1}$ **A1**

3. a) $\text{Acceleration} = \dfrac{\text{Change in velocity}}{\text{Time}} = \dfrac{4\text{ m s}^{-1}}{80\text{ s}} = 0.5\text{ m s}^{-2}$ **A1**

   b) $40 \times (160 - 80) = 40 \times 80 = 3200$ m (3.2 km) **A1**

4. Straight line connecting points (0, 0) and (12, 6) **A1**
   Horizontal line connecting points (12, 6) and (22, 6) **A1**
   Straight line connecting points (22, 6) and (30, 0) **A1**
   Correctly labelled axes **A1**



5. a) $u = 5\text{ m s}^{-1}$, $a = 0.5\text{ m s}^{-2}$, $t = 10\text{ s}$, $v = ?$
   $v = u + at$
   $v = 5 + 0.5 \times 10$ **M1**
   $v = 10\text{ m s}^{-1}$ **A1**

   b) $s = ut + \dfrac{1}{2}at^2$

   $s = 5 \times 10 + \dfrac{1}{2} \times 0.5 \times 10^2$ **M1**

   $s = 50 + 25 = 75$ m **A1**

6. $u = 0\text{ m s}^{-1}$, $a = 5\text{ m s}^{-2}$, $s = 1\text{ km} = 1000\text{ m}$, $v = ?$
   $v^2 = u^2 + 2as$
   $v^2 = 0^2 + 2 \times 5 \times 1000 = 10000$ **M1**
   $v = \sqrt{10000}$ **M1**
   $= 100\text{ m s}^{-1}$ **A1**

7. $u = 15\text{ m s}^{-1}$, $t = 3\text{ s}$, $a = -4\text{ m s}^{-2}$, $s = ?$
   $s = ut + \dfrac{1}{2}at^2$
   $s = 15 \times 3 + \dfrac{1}{2}(-4) \times 3^2$ **M1**
   $s = 45 - 18 = 27$ m **A1**

8. $s = 45$ m, $u = 0$ m s^{-1}, $a = 10$ m s^{-2}, $t = ?$

$s = ut + \frac{1}{2}at^2$

$45 = 0 \times t + \frac{1}{2} \times 10 \times t^2$ **M1**

$45 = 5t^2 \therefore t^2 = 9$ **M1**

$t = \pm 3$ s, but since time can only be positive in this model, $t = 3$ s **A1**

Techni
reache
v = 0 m
instanta
starts t

9. $v = 0$ m s^{-1}, $u = 5$ m s^{-1}, $a = -9.8$ m s^{-2}, $s = ?$

$v^2 = u^2 + 2as$

$0^2 = 5^2 + 2 \times (-9.8) \times s = 25 - 19.6s$ **M1**

$s = \frac{25}{19.6} = 1.27551... \text{ m} = 1.28 \text{ m (3 s.f.)}$ **A1**

Hint: V
as the
questio
negativ
hence i
acceler

10. a) The gradient of the line is $\frac{v - \square}{t - 0}$ gradient represents acceleration of the pa

Rearrange to $a = \frac{v - u}{t}$, so $v = u + at$ **A1**

b) Ti dis ace travelled, s, is given by the area under the graph **M1**

This can be found using the area of a trapezium formula, $s = \left(\frac{u+v}{2}\right)t$ **A1**

Preview of Answers Ends Here