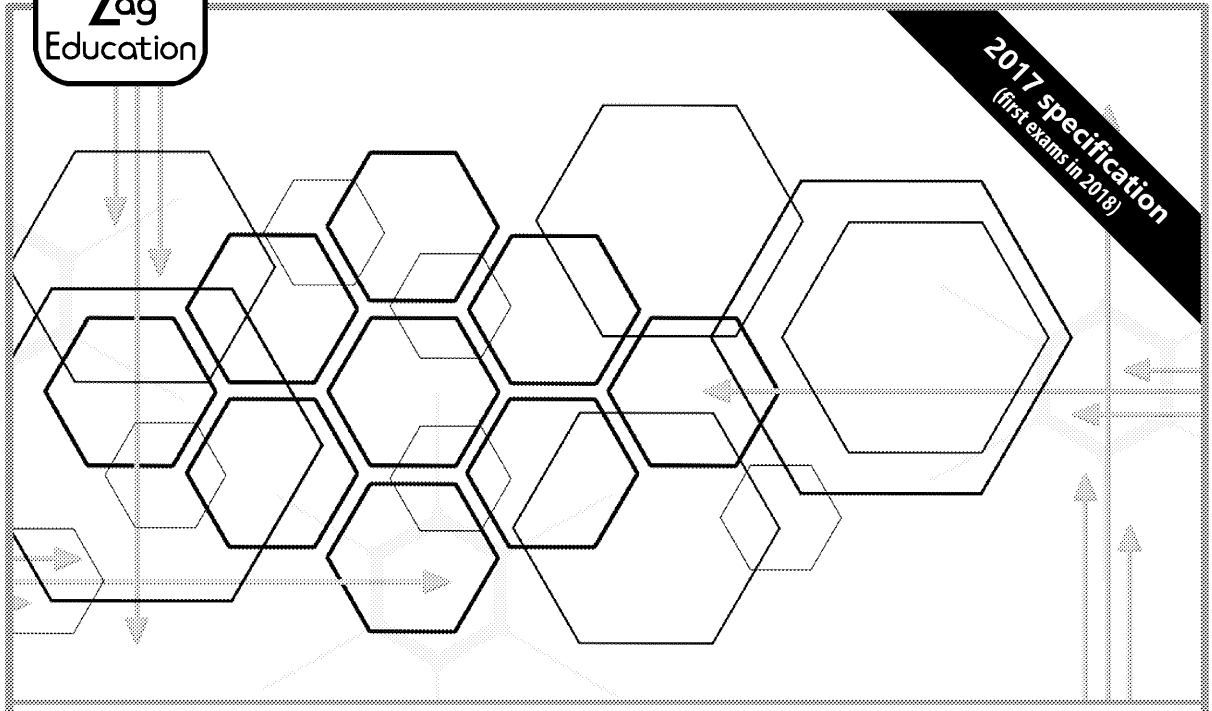
Zig Zag Education

Maths **A Level | Edexcel | 9MA0**



Topic Tests: Fundamentals Tests – Set B

For A Level Year 2 Edexcel

Statistics and Mechanics

zigzageducation.co.uk

POD 8936

Contents

Teacher's Introduction

Content

This pack contains 6 fundamentals level topic tests and solutions for the Edexcel Applied Mathematics Year 2 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 to help students who may have made a mistake or who are struggling on a particular question.

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

For students who have mastered 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 combines and extends 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.

Cross-referencing Grid

Topic	Edexcel spec. points	Sub-topics
Regression and Correlation	2.2, 5.1	Exponential models, measuring correlation, hypothesis testing for zero correlation
Conditional Probability	3.1–3.3	Set notation, conditional probability, conditional probabilities in Venn diagrams, probability formulae, tree diagrams
The Normal Distribution	4.2–4.3, 5.3	The normal distribution, finding probabilities, the inverse normal distribution, the standard normal distribution, finding μ and σ, approximating a binomial distribution, hypothesis testing with the normal distribution
Moments	6.1, 9.1	Moments, resultant moments, equilibrium, centres of mass, tilting
Forces and Friction	8.2, 8.4–8.6	Resolving forces, inclined planes, friction, modelling with statics, friction and static particles, dynamics and inclined planes, connected particles
Kinematics and Projectiles	7.1, 7.3–7.5	Horizontal projection, projection at any angle, projection motion formulae, vectors in kinematics, variable acceleration in one dimension, differentiating vectors, integrating vectors

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)
Regression and Correlation		**The Normal Distribution**	
1.1.a	25	3.1a	35
1.1b	25	3.1b	35
1.2a	25	3.2a	50
1.2b	25	3.2b	50
1.3a	30	3.3a	65
1.3b	30	3.3b	65
Conditional Probability		**Moments**	
2.1a	35	4.1a	35
2.1b	35	4.1b	35
2.2a	35	4.2a	55
2.2b	35	4.2b	55
2.3a	65	4.3a	70
2.3b	65	4.3b	70

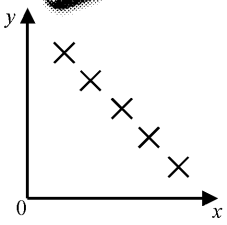
Regression and Correlation – Test B (25 mi

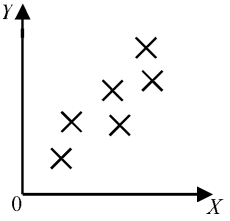
Subtopics: exponential models, measuring correlation, hypothesis testing

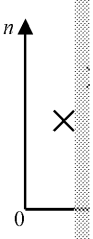
1. Write the following equations in the form $\log y = A + B\log x$, where A a should be given to **3 significant figures** where appropriate:
   a) $y = 100x$ b) $y = 100x^2$ c) $y - x^{-2} = 0$

2. Write the following equations in the form $y = kb^x$, where k and b are re given to **3 significant figures** where appropriate:
   a) $\log y = 2 + x$ b) $x + \log y = -2$ c) $\log_2 y = \log_2 7 + 3x$

3. Fill in the gaps in the following sente e:
   'The **product moment cor n coefficient** r measures the amount two variables.'

4. **Estim** value of the product moment correlation coefficient r for th
   a) 

   b) 

   c) 

5. The following data is a simple random sample taken from the large da temperature and daily mean wind speed in Jacksonville in July 1987:

Daily mean temperature (°C)	30.5	27.3	27.2	25.0
Daily mean wind speed (kn)	4.0	2.9	2.3	5.6

   Use your calculator to calculate the product moment correlation coeffi temperature and the daily mean wind speed. Give your answer to **4 de**

6. A goatherd in Leeming thinks there is a **negative correlation** between and the amount of rainfall each day. She collects a random sample fro **nine days** in May 2015. She then calculates a product moment correla Test at the **10% level of significance** whether there is evidence for the hypotheses clearly.

7. Dan collects the following data sho i t e population of termites in a

Week, w		8	18	27	31
Termite po) T	10	13	26	56	110
ln(T)	2.30			4.03	

   a) Copy and complete Dan's table.
   b) Use your calculator to calculate the product moment correlation c **rounded** values of $\ln(T)$. Give your answer to **3 significant figu**

Preview of Questions Ends Here

Solutions to The Normal Distribution – Test B

1. A normal distribution has a (single) symmetrical bell-shaped curve, but the illustra
not symmetrical **A1** **[1 Mark]**

2. –13, 4 **A1A1** **[2 Marks]**

3. 0 **A1** **[1 Mark]**

4. a) $P(X < 94) = 0.5$ **A1**
b) $P(X = 94) = 0$ **A1**
c) $P(X \geq 94) = 0.5$ **A1** **[3 Marks]**

5. 95% of the data in a normal distribution lies wit' m 2 st n ard deviations of the me
So $3 = 19 - 2\sigma$ and $35 = 19 + 2\sigma$
Hence $2\sigma = 16$, so $\sigma = 8$ **A1** **[2 Marks]**

6. $X \sim N(1 \quad ^2)$
a) 8) = 0.158655… = 0.159 (3 s.f.) **A1**
b) 9.3) = 0.636830… = 0.637 (3 s.f.) **A1**
c) $P(7.5 < X < 11) = 0.585812\ldots = 0.586$ (3 s.f.) **A1** **[3 Marks]**

7. a) $P(Z > a) = 0.3000$
$\therefore a = 0.524400\ldots = 0.5244$ (4 d.p.) **A1**
b) $P(Z < a) = 0.9000$
$\therefore a = 1.28155\ldots = 1.2816$ (4 d.p.) **A1** **[2 Marks]**

8. B(n, p) can be approximated by a normal distribution if:
n is large **A1**
p is close to 0.5 **A1** **[2 Marks]**

9. a) $\mu = np$
$= 250 \times 0.54$ **M1**
$= 135$ **A1**
b) $\sigma^2 = np(1-p)$
$= 250 \times 0.54 \times (1-0.54)$ **M1**
$= 62.1$ **A1** **[4 Marks]**

10. a) $P(Y \leq 505) \approx P(X < 505.5)$ **M1**
$= 0.737730... = 0.738$ (3 s.f.) **A1**
b) $P(Y > 500) \approx P(X > 500.5)$ **M1**
$= 0.369441... = 0.369$ (3 s.f.) **A1** **[4 Marks]**

11. $H_0 : \mu = 150$, $H_1 : \mu > 150$, so the te t i c led
Sample size = 64
Level of significan c
Assu s t $\sim N(150, 5^2)$ **M1**
Sampl $\overline{X}$ is normally distributed with $\overline{X} \sim N\left(150, \frac{5^2}{64}\right)$ i.e. $\overline{X} \sim N(150, 0.6$

$P(\overline{X} > 151) = 0.0547992...$ **M1**

0.0547992… < 0.1 so there is enough evidence at the 10% level of significance to
conclude that the mean of the whole population is greater than 150 **A1** **[4 Marks]**

Preview of Answers Ends Here