Edexcel GCSE

Mathematics

Higher Tier

Number: Integers

Information for students

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 2 questions in this selection.

Advice for students

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.

Information for teachers

The questions in this document are taken from the 2009 GCSE Exam Wizard and include questions from examinations set between January 2003 and June 2009 from specifications 1387, 1388, 2540, 2544, 1380 and 2381.

Questions are those tagged as assessing "Integers" though they might assess other areas of the specification as well. Questions are those tagged as "Higher" so could have (though not necessarily) appeared on either an Intermediate or Higher tier paper.

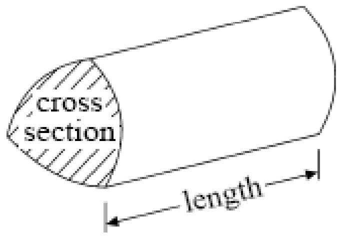
GCSE Mathematics

Formulae: Higher Tier

You must not write on this formulae page.

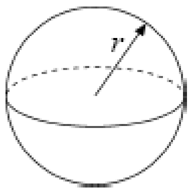
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length



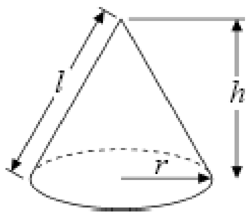
Volume of sphere $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

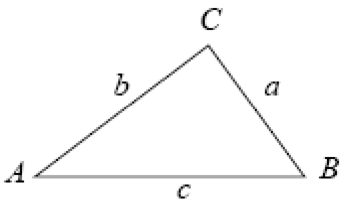


Volume of cone $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle ABC



Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

1. Prove algebraically that the sum of the squares of any two odd numbers leaves a remainder of 2 when divided by 4.

(Total 3 marks)

2. John says "For all prime numbers, *n*, the value of $n^2 + 3$ is always an even number".
Give an example to show that John is **not** correct.

(Total 2 marks)

01. $(2m + 1)^2 = 4m^2 + 4m + 1$

$(2n + 1)^2 = 4n^2 + 4n + 1$

Sum $= 4m^2 + 4n^2 + 4m + 4n + 2 = 4(m^2 + n^2 + m + n) + 2$ 3

B1 for $(2m + 1)^2$

B1 for sum of correct expansion of 2 correct expressions for different odd squares

B1 fully correct answer including the factor 4, and a clear remainder of 2

SC B1 for $(n + 2)^2 + n^2$ oe

[3]

02. 7 which is not even 2

$2^2 + 3 =$

B2

(B1 for correctly evaluating $n^2 + 3$ with a prime number value for n.)

[2]

01. Mathematics A Paper 3

It was disappointing that only about half of the candidates managed to gain marks in this question. Some candidates provided the required counter-example very quickly but many displayed a lack of understanding of prime numbers and/or squaring. It was not uncommon for candidates to substitute a large number of prime and non-prime numbers into the expression. Some used only prime numbers but, forgetting that 2 is prime, concluded that John was correct. Some considered 1 to be a prime number. Many doubled n rather than squaring it.

Mathematics B Paper 16

One in three of the candidates recognised 2 as a prime number and successfully computed an answer of 7 (an odd number). Many failing to see this earned one mark for a correct substitution of any prime number (correctly calculated).

Far too often n^2 was seen as $2 \times n$ and all marks were lost, $3^2 + 3 = 9$ was a common answer.

02. This proved to be very difficult. As no help had been given with the way in which the two numbers were to be represented, a mark was given for their sum of the squares of two integers which differed by 2. Some candidates assumed that the odd numbers had to be consecutive and considered $(2n - 1)^2 + (2n + 1)^2$. One or two candidates gave a general argument given on the properties of odd and even square numbers. These methods had some merit, but were generally incomplete.