Chhetri Academy

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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 28

Algebraic proof

Higher tier

Past paper question booklet

26	2003-2025	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

15. (a) Show that $(2a-1)^2-(2b-1)^2 = 4(a-b)(a+b-1)$

Leave blank

(3)

(b) Prove that the difference between the squares of any two odd numbers is a multiple of 8.
(You may assume that any odd number can be written in the form $2r-1$, where r is an integer).

(3)

14. Prove that,

$$(n + 1)^2 - (n - 1)^2$$

is a multiple of 4, for all positive integer values of n.

(3)

Blank

24. (i) Expand and simplify

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

.....

n is a whole number.

(ii) Prove that $n^2 + (n + 1)^2$ is always an odd number.

Q24

(Total 4 marks)

22. Prove that $(3n + 1)^2 - (3n - 1)^2$ is a multiple of 4, for all positive integer values of n.

Q22

(Total 3 marks)

25. Prove, using algebra, that the sum of two consecutive whole numbers is always an odd number.

Q25

(Total 3 marks)

Question 06

12 Prove that $(n-1)^2 + n^2 + (n+1)^2 = 3n^2 + 2$

(Total for Question 12 is 2 marks)

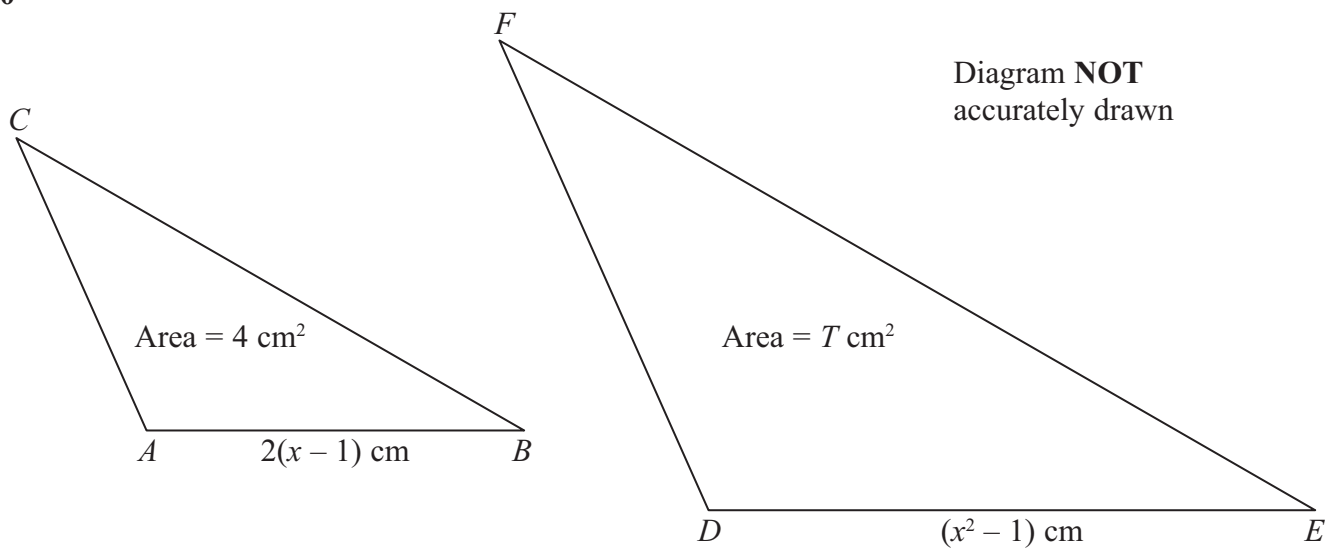
21 Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of } 8$$

for all positive integer values of n.

(Total for Question 21 is 3 marks)

20



Triangles ABC and DEF are mathematically similar.

The base, AB, of triangle ABC has length $2(x - 1)$ cm
The base, DE, of triangle DEF has length $(x^2 - 1)$ cm

The area of triangle ABC is 4 cm^2
The area of triangle DEF is T cm^2

Prove that

$$T = x^2 + 2x + 1$$

(Total for Question 20 is 4 marks)

***21** Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

(Total for Question 21 is 4 marks)

9 (a) Factorise $3t + 12$

.....

(1)

(b) (i) Expand and simplify $7(2x + 1) + 6(x + 3)$

.....

(ii) Show that when x is a whole number

$$7(2x + 1) + 6(x + 3)$$

is always a multiple of 5

(3)

(Total for Question 9 is 4 marks)

21 (a) Expand and simplify $(y - 2)(y - 5)$

.....

(2)

*(b) Prove algebraically that

$$(2n + 1)^2 - (2n + 1) \quad \text{is an even number}$$

for all positive integer values of n.

(3)

(Total for Question 21 is 5 marks)

21 $x = 0.0\dot{4}\dot{5}$

Prove algebraically that x can be written as $\frac{1}{22}$

(Total for Question 21 is 3 marks)

Question 13

***24** Prove that, for all positive values of n,

$$\frac{(n+2)^2-(n+1)^2}{2n^2+3n}=\frac{1}{n}$$

(Total for Question 24 is 4 marks)

Question 14

16 n is an integer greater than 1

Prove algebraically that $n^2 - 2 - (n - 2)^2$ is always an even number.

(Total for Question 16 is 4 marks)

Question 15

15 $x = 0.4\dot{3}\dot{6}$

Prove algebraically that x can be written as $\frac{24}{55}$

(Total for Question 15 is 3 marks)

17 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n+1)$ and $\frac{1}{2}(n+1)(n+2)$ is always a square number.

(Total for Question 17 is 2 marks)

Question 17

12 Prove that the square of an odd number is always 1 more than a multiple of 4

(Total for Question 12 is 4 marks)

Question 18

November 2018 | 1MA1/3H | Original Q15

15 Prove algebraically that the difference between the squares of any two consecutive odd numbers is always a multiple of 8

(Total for Question 15 is 3 marks)

Question 19

June 2019 | 1MA1/1H | Original Q13

13 Given that n can be any integer such that $n > 1$, prove that $n^2 - n$ is never an odd number.

(Total for Question 13 is 2 marks)

Question 20

November 2019 | 1MA1/3H | Original Q15

15 Prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4

(Total for Question 15 is 3 marks)

Question 21

November 2020 | 1MA1/3H | Original Q15

15 Prove algebraically that $0.7\dot{3}$ can be written as $\frac{11}{15}$

(Total for Question 15 is 2 marks)

20 Prove algebraically that $0.1\dot{2}\dot{3}$ can be written as $\frac{61}{495}$

(Total for Question 20 is 3 marks)

Question 23

13 Prove algebraically that $0.0\dot{7}\dot{2}\dot{3}$ can be written as $\frac{241}{3330}$

(Total for Question 13 is 3 marks)

10 There are only red counters and yellow counters in bag **A**.

number of red counters : number of yellow counters = 3 : 5

There are only green counters and blue counters in bag **B**.
The number of counters in bag **B** is half the number of counters in bag **A**.

Given that there are x red counters in bag **A**,

use algebra to show that the total number of counters in bag **A** and bag **B** is $4x$

(Total for Question 10 is 3 marks)

Question 25

14 Prove algebraically that $0.4\dot{6}\dot{2}$ can be written as $\frac{229}{495}$

(Total for Question 14 is 3 marks)

10 Prove that the difference in the squares of two consecutive even numbers is always a multiple of 4

(Total for Question 10 is 3 marks)