



ACHIEVE ACADEMY

GCSE Maths — Higher Tier

Algebraic Proof · Practice Booklet

NAME: _____

CLASS: _____

DATE: _____

☐ Developing

☒ Secure

☐ Greater Depth

Answer every question in the working space provided. Method marks are available for correct working even if the final answer is wrong. Check the time allowed with your tutor before you start.

Algebraic Proof

Total marks available: 130

● Algebraic Proof

Q1

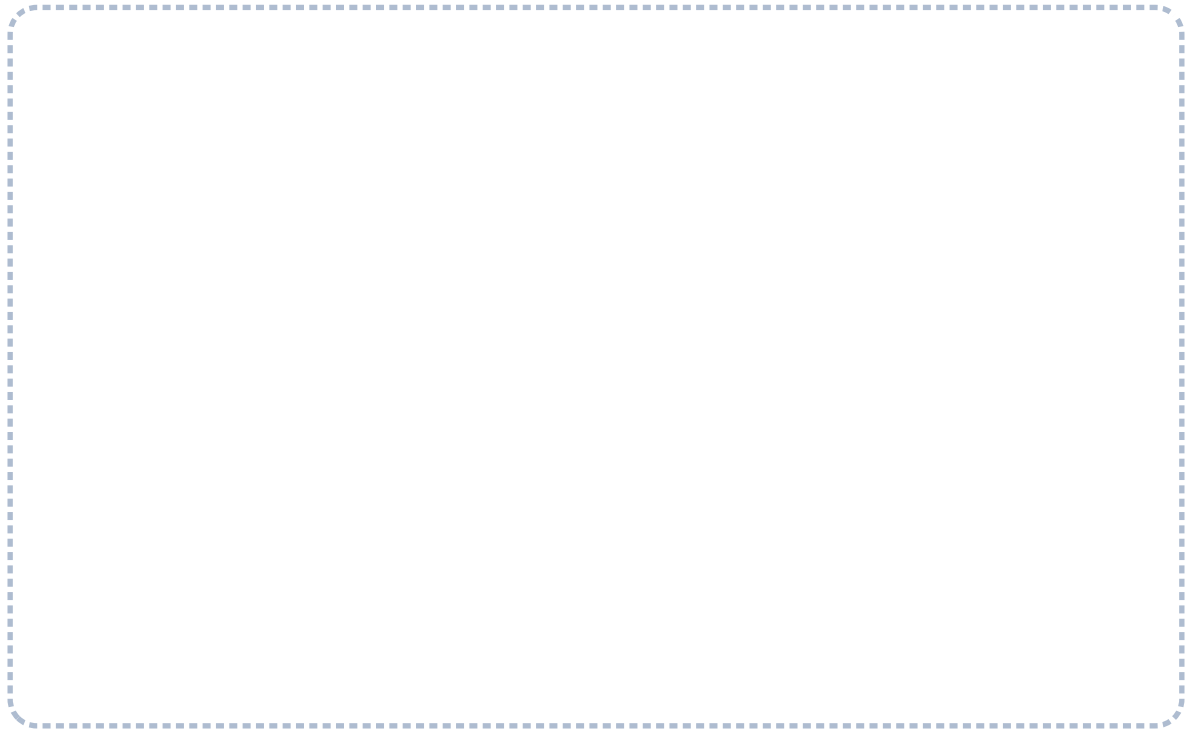
[4 marks]

Prove algebraically that $m(m + 1)$ is always even.

Q2

[4 marks]

Prove algebraically that the difference between the squares of $2t$ and $2t + 4$ is always a multiple of 4.



Q3

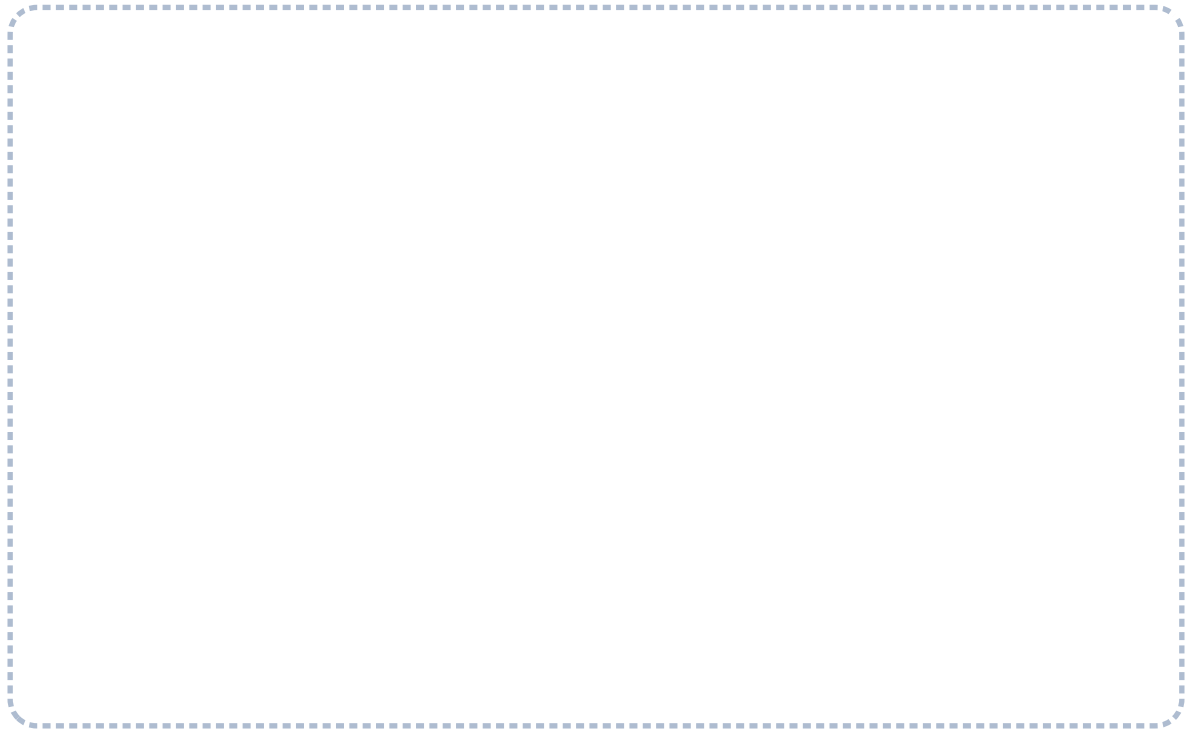
[4 marks]

Prove algebraically that $n(n + 1)$ is always even.

Q4

[4 marks]

Prove algebraically that the difference between the squares of $2p$ and $2p + 8$ is always a multiple of 4.



Q5

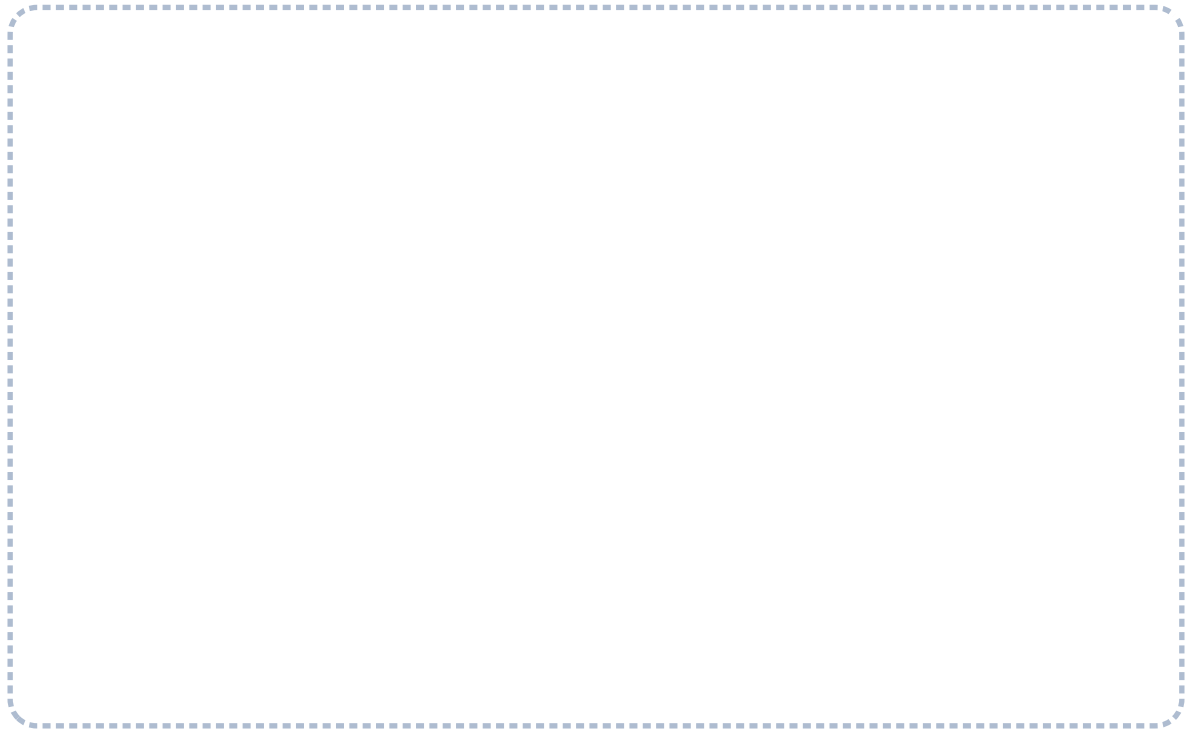
[4 marks]

Prove algebraically that $m(m + 3)$ is always even.

Q6

[4 marks]

Prove algebraically that the difference between the squares of $2p$ and $2p + 10$ is always a multiple of 4.



Q7

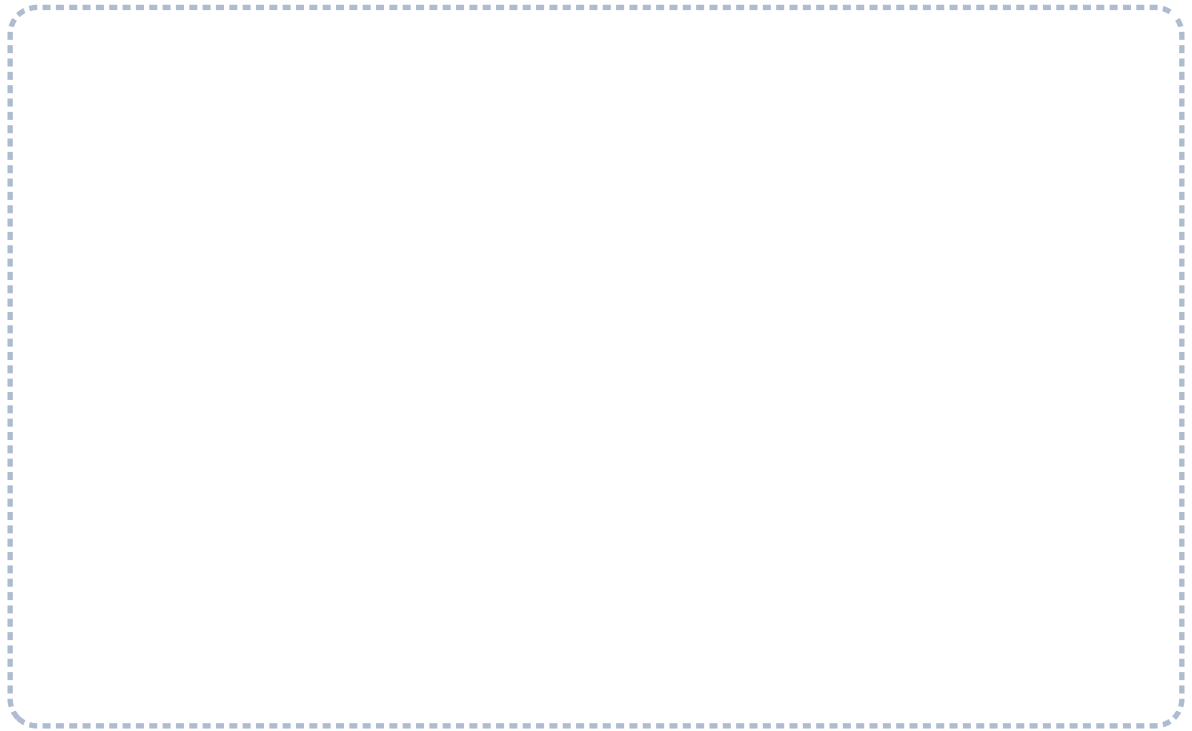
[4 marks]

Prove algebraically that $t(t + 3)$ is always even.

Q8

[4 marks]

Prove algebraically that the difference between the squares of $2t$ and $2t + 10$ is always a multiple of 4.



Q9

[4 marks]

Prove algebraically that $p(p + 3)$ is always even.

Q10

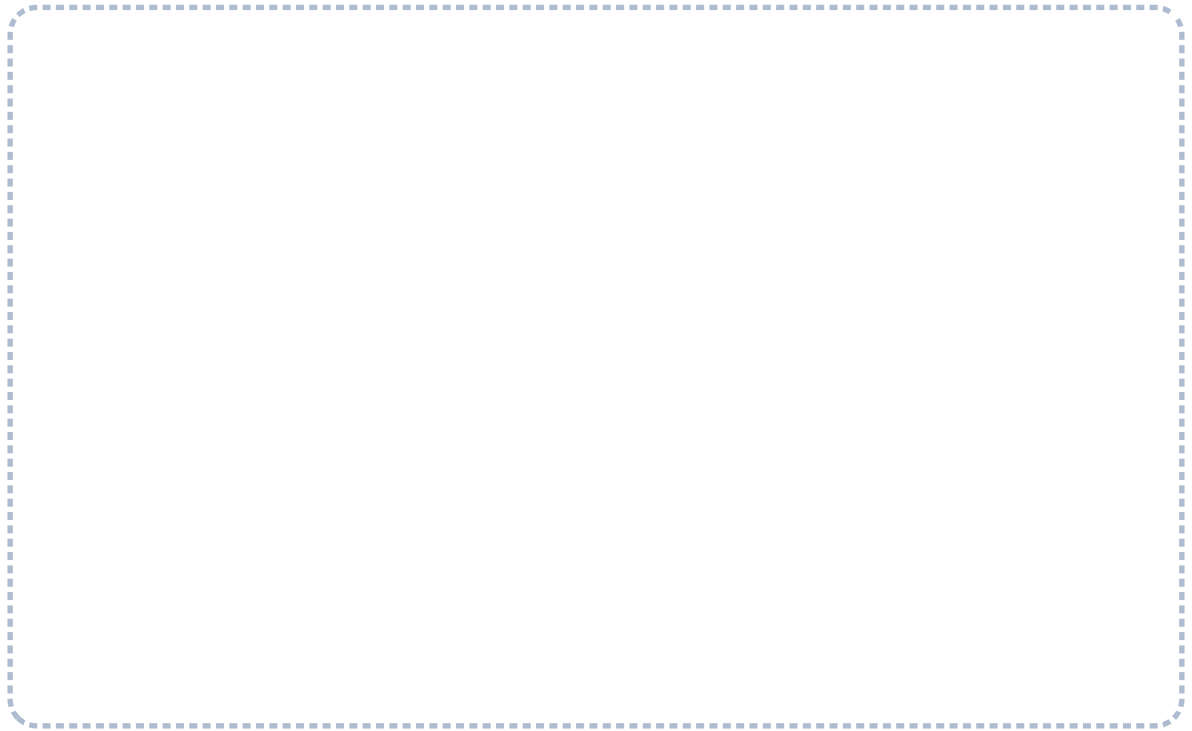
[4 marks]

Prove algebraically that $p(p + 5)$ is always even.

Q11

[4 marks]

Prove algebraically that the product of two consecutive odd numbers, plus 1, is always a multiple of 4.



Q12

[4 marks]

Prove algebraically that $(t + 4)^2 - (t - 4)^2$ is always a multiple of 16.

Q13

[4 marks]

Prove algebraically that $(t + 6)^2 - (t - 6)^2$ is always a multiple of 24.

Q14

[4 marks]

Prove algebraically that $(m + 3)^2 - (m - 3)^2$ is always a multiple of 12.

Q15

[4 marks]

Prove algebraically that $(p + 6)^2 - (p - 6)^2$ is always a multiple of 24.

Q16

[4 marks]

Prove algebraically that $(m + 2)^2 - (m - 2)^2$ is always a multiple of 8.

Q17

[4 marks]

Prove algebraically that $(n + 6)^2 - (n - 6)^2$ is always a multiple of 24.

Q18

[4 marks]

Prove algebraically that $(n + 3)^2 - (n - 3)^2$ is always a multiple of 12.

Q19

[4 marks]

Prove algebraically that $(p + 4)^2 - (p - 4)^2$ is always a multiple of 16.

Q20

[4 marks]

Prove algebraically that $(t + 7)^2 - (t - 7)^2$ is always a multiple of 28.

Q21

[5 marks]

Prove algebraically that $\frac{1}{p} - \frac{1}{(p + 2)} = \frac{2}{(p(p + 2))}$, for $p \neq 0$ and $p \neq -2$.

Q22

[5 marks]

Prove algebraically that the sum of 3 consecutive even numbers, starting from $2t$, is always a multiple of 6.

Q23

[5 marks]

Prove algebraically that $\frac{1}{t} - \frac{1}{t+7} = \frac{7}{t(t+7)}$, for $t \neq 0$ and $t \neq -7$.

Q24

[5 marks]

Prove algebraically that the sum of 3 consecutive even numbers, starting from $2n$, is always a multiple of 6.

Q25

[5 marks]

Prove algebraically that $\frac{1}{m} - \frac{1}{m+6} = \frac{6}{m(m+6)}$, for $m \neq 0$ and $m \neq -6$.

Q26

[5 marks]

Prove algebraically that $\frac{1}{p} - \frac{1}{p+6} = \frac{6}{p(p+6)}$, for $p \neq 0$ and $p \neq -6$.

Q27

[5 marks]

Prove algebraically that $\frac{1}{p} - \frac{1}{(p+8)} = \frac{8}{(p(p+8))}$, for $p \neq 0$ and $p \neq -8$.

Q28

[5 marks]

Prove algebraically that the sum of 7 consecutive even numbers, starting from $2n$, is always a multiple of 14.

Q29

[5 marks]

Prove algebraically that $\frac{1}{t} - \frac{1}{t+5} = \frac{5}{t(t+5)}$, for $t \neq 0$ and $t \neq -5$.

Q30

[5 marks]

Prove algebraically that the sum of 5 consecutive even numbers, starting from $2p$, is always a multiple of 10.