**Non-Calculator**

**Q1.**

$(3x + 1)(x - 2) + ax + b \equiv 3x^2 + 8x - 5$

Work out the values of $a$ and $b$.

_____

_____

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_____

$a =$................................................................

$b =$................................................................

**(Total 4 marks)**

**Q2.**

Write     $x^2 + 8x + 7$     in the form     $(x + a)^2 + b$

_____

_____

_____

_____

_____

Answer _____

**(Total 3 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q3.**

f($x$) = 2$x^2$
g($x$) = $x$ + 5

Circle the composite function     fg($x$)

      2$x^2$ + 5                    2($x$ + 5)$^2$                   2($x^2$ + 5)                   4($x$ + 5)$^2$

**(Total 1 mark)**

**Q4.**

The sum of the squares of two consecutive integers is one greater than twice the product of the integers.

For example    $9^2$ + $10^2$ = 81 + 100   and   2 × 9 × 10 = 180
                                                  = 181

Prove this result algebraically.

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**(Total 5 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q5.**

$n$ is an integer.

Show that $\dfrac{n(n-1)}{2} + \dfrac{n(n+1)}{2}$ is a square number.

_____

_____

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_____

**(Total 3 marks)**

**Q6.**

(a)    Expand and simplify    $(2x + 1)(3x - 4)$

_____

_____

Answer _____

**(2)**

(b)    Factorise    $6x^2 - 23x - 4$

_____

_____

Answer _____

**(2)**

**(Total 4 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q7.**

f($x$) = 2$x$ + $c$
g($x$) = $cx$ + 5
fg($x$) = 6$x$ + $d$
$c$ and $d$ are constants.

Work out the value of $d$.

Answer _____

**(Total 3 marks)**

**Q8.**

Expand and simplify     $(y^2 - 5y + 2)(2y - 3)$

Answer _____

**(Total 3 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q9.**

Expand and simplify     $(x - 4)(2x + 3y)^2$

Answer _____

**(Total 4 marks)**

**Q10.**

$(3x - 1)(ax + b) \equiv 12x^2 - 19x + c$

Work out the values of $a, b$ and $c$.

$a =$ _____ $b =$ _____ $c =$ _____

**(Total 4 marks)**

**Q11.**

Factorise $9a^2 - b^2$

_____

_____

_____

Answer _____

**(Total 2 marks)**

## Calculator

**Q12.**

(a) Factorise fully $9y^3 - 6y$

_____

_____

_____

_____

Answer _____

**(2)**

(b) Factorise $3x^2 - 22x + 7$

_____

_____

Answer _____

**(2)**

**(Total 4 marks)**

**Q13.**

Expand and simplify $(t + 4)^3$

_____

_____

_____

_____

Answer _____

**(Total 3 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q14.**

Prove that $x^2 + x + 1$ is always positive.

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**(Total 3 marks)**

**Q15.**

For all values of $x$,     $f(x) = x^2 + 1$     $g(x) = x - 5$

(a)    Show that     $fg(x) = x^2 - 10x + 26$

_____

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_____

**(2)**

(b)    Solve     $fg(x) = gf(x)$

_____

_____

_____

_____

_____

_____

_____

$x =$ _____

**(4)**

**(Total 6 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q16.**

$n$ is an integer.

$$S = \frac{1}{2}n(n+1)$$

Prove that $8S + 1$ is an odd square number.

_____

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**(Total 5 marks)**

**Q17.**

For all values of $x$, $\quad f(x) = \dfrac{4x - 3}{5}$

Work out $\quad f^{-1}(x)$

_____

_____

_____

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_____

Answer _____

**(Total 3 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q18.**

$a^2 - b^2 \equiv (a + b)(a - b)$

$a$ and $b$ are positive whole numbers with $a > b$

$a^2 - b^2$ is a **prime** number.

Why are $a$ and $b$ consecutive numbers?

_____

_____

_____

_____

**(Total 2 marks)**

**Q19.**

(a)   Factorise fully   $3x^2 - 12$

_____

_____

_____

Answer _____

**(2)**

(b)   Factorise   $5x^2 + 4xy - 12y^2$

_____

_____

_____

_____

Answer _____

**(3)**
**(Total 5 marks)**

**Q20.**

(a)    Factorise fully     $5m^2 - 20p^2$

_____

_____

_____

Answer _____

**(3)**

(b)    You are given that    $p = 15$    and    $5m^2 - 20p^2 = 0$

Using your answer to part (a), or otherwise, work out the values of $m$.

_____

_____

_____

_____

_____

Answer _____

**(2)**
**(Total 5 marks)**

**Q21.**

f($x$) = $3x$

Circle the expression for f$^{-1}$($x$)

$- 3x$          $\dfrac{3}{x}$          $\dfrac{1}{3x}$          $\dfrac{x}{3}$

**(Total 1 mark)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**

**Q22.**

Prove that     $(5n + 3)(n − 1) + n(n + 2)$
is a multiple of 3 for all integer values of $n$.

**(Total 4 marks)**

**Q23.**

Factorise     $3x^2 + 14x + 8$

Answer _____

**(Total 2 marks)**

**Q24.**

$w$, $x$ and $y$ are three integers.

$w$ is 2 less than $x$
$y$ is 2 more than $x$

Prove that     $wy + 4 = x^2$

**(Total 3 marks)**

**AQA GCSE Maths - Further Quadratics, Rearranging Formulae and Identities (H)**