2.6 Mixed Higher practice: equations, formulae and identities

Name: _____ Class: _____ Date: _____ **Total: 28 marks**

KEY WORDS algebraic fraction

Mixed Higher practice: equations, formulae and identities

Objective

Combine the topic-2 strands in unfamiliar settings: index equations, subject-twice rearrangements, algebraic-fraction chains, vertex-form optima, inequality regions and context-formed quadratics (objectives Higher 2.1–2.8).

1 Key knowledge and worked examples

One line per strand. Indices: one base, so equate indices. Formulae: same operation both sides; powers need rooting; subject twice means collect and factorise. Fractions: factor, cancel whole factors, invert to divide. Vertex form: minimum at $(-b', c')$ read straight off $a(x+b')^2+c'$. Inequalities: critical values, then the parabola's sign. Pairs: substitute the linear into the quadratic and keep both points.

2 Practice

2.1 Simplify $(x^3)^2 \div x^{-4}$ [2]

2.2 Make g the subject of $T = 2\pi\sqrt{\dfrac{l}{g}}$ [3]

2.3 Simplify $\dfrac{x^2 + 2x - 8}{x^2 - 16}$ [3]

2.4 Write $3x^2 - 12x + 5$ in the form $a(x + b)^2 + c$ [3]

2.5 Solve $4x^2 - 25 \leq 0$ [3]

3 Exam-style questions

3.1 *(Original.)* Given that $\dfrac{2^{3n} \times 2^{n+4}}{2^{2n+1}} = 32$, find the value of n. [3]

3.2 *(Original.)* Write $\dfrac{x+1}{x-2} - \dfrac{3}{x+1}$ as a single fraction in its simplest form. [3]

3.3 *(Original.)* A ball is thrown so that its height after t seconds is $h = 20t - 5t^2$ metres. (a) Write h in the form $a(t+b)^2+c$. (b) State the maximum height and when it occurs. [4]

3.4 *(Original.)* The surface area of a closed cylinder is given by $A = 2\pi r^2 + 2\pi rh$. Make h the subject, then find h when $A = 120\pi$ and $r = 3$. [4]