Ciaran Mock Paper 1

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Paper 1

1. (3 points) Multiply out the brackets and simplify
$$(4x-1)^2-(4x-1)$$
2. (3 points) Evaluate
$$10\frac{2}{3}\div 1\frac{1}{3}$$
3. (3 points) Allan has £280 and spends 32% of it. How much does he have left?
4. (a) (1 point) Factorise
$$40x^2-25x$$
(b) (2 points) Factorise
$$32x^2-18$$
5. (2 points) Express $x^2-10x+30$ in the form $(x-a)^2+b$ where $a,b\in\mathbb{R}$
6. (a) (3 points) Change the subject of the formula to x
$$\sqrt{\frac{x-6}{11}}=y$$
(b) (1 point) If $x=50$ in the above formula, what are the possible values of y?
7. (3 points) A bottle of ketchup contains 605ml. It is on offer and contains 10% more than the standard bottle. How much ketchup does the standard bottle contain?
8. (2 points) Simplify $(5x^2)^3$
9. This question concerns the quadratic function with equation $y=x^2-x-12$.
   (a) (3 points) Calculate the **coordinates** of the roots of this function.
   (b) (1 point) Write down the **coordinate** of the $y-$intercept of this function.
   (c) (1 point) Write down the equation of the axis of symmetry of this function.
10. Consider the points $A\left(2,\frac{1}{2}\right)$ and $B\left(4,\frac{3}{2}\right)$. They are joined by a straight line.
   (a) (2 points) Calculate the gradient of this line.
   (b) (2 points) Determine the equation of this line.
   (c) (1 point) Find the **coordinates** of the point where this line crosses the $y-$axis.
11. (a) (3 points) Fully simplify $\sqrt{216}-\sqrt{6}+\sqrt{24}$.
   (b) (2 points) Express $\frac{10}{3\sqrt{2}}$ with a rational denominator in its simplest form.

12. Beth takes some loose change to the bank. In one money bag there are 40 coins, each of which is either a 20p or a 50p.
    Let x represent the number of 20p coins and let y represent the number of 50p coins in the bag.
    (a) (1 point) Write an equation to express this information.
    (b) (1 point) The bag contains exactly £15.50. Write an equation to express this information.
    (c) (4 points) Find, using algebraic techniques, the number of 20p coins and 50p coins in the bag.

13. A rectangle is constructed with length $(x + 6)$ and breadth $(x - 2)$.
    (a) (2 points) Prove that the area of the rectangle can be written as
    $$x^2 + 4x - 12.$$
    (b) (4 points) Given that the area of the rectangle is 9, use algebraic techniques to determine x.

14. This question concerns a quadratic function $f(x) = ax^2 + bx + c$ where a is non-zero.
    (a) (1 point) With reference to the quadratic formula, or otherwise, explain why having $b^2 - 4ac = 0$ implies that f has one real repeated root.
    (b) (1 point) With reference to the quadratic formula, or otherwise, explain why having $b^2 - 4ac < 0$ implies that f has no real roots.
    (c) (1 point) With reference to the quadratic formula, or otherwise, explain why having $b^2 - 4ac > 0$ implies that f has two distinct real roots.