If, for all values of x, $(3p - 2t)x + r - 4t^2 = 0$, show that $r = 9p^2$. [10 MARKS]

$3p - 2t = 0$

$3p = 2t$

$\frac{3p}{2} = t$

$r - 4t^2 = 0$

$r = 4t^2$

$r = 4\left(\frac{3p}{2}\right)^2$

$= 4\left(\frac{9p^2}{2}\right) = 3p^2$ QED

Simplify the equation $\frac{x + y^2}{x^2} + \frac{x - 1}{x} = -1$ and hence find the ratio of x^2 to y^2.

multiply by x^2 $\rightarrow$ $x + y^2 + x(x-1) = -1(x^2)$

$\cancel{x} + y^2 + x^2 \cancel{- x} = -x^2$

$y^2 + 2x^2 = 0$ [10 MARKS]

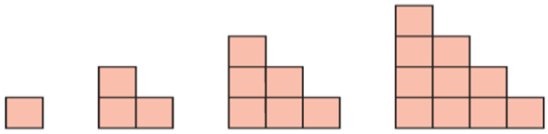
RATIO $x^2 : y^2$?

$2x^2 = -y^2$

$1x^2 = -\frac{1}{2}y^2$

$1 : -\frac{1}{2}$ [10 MARKS]

By converting the following designs into a number pattern, write down a rule for the pattern. Use the rule to find out how many bricks are needed to build the 49th design.



X =	0	1	2	3
Pattern	1 = b	3	6	10
1st Difference		2	3	4
2nd Difference			1 = 2a	1

QUADRATIC ⇒ $ax^2 + b$

$a = \frac{1}{2}$, $b = 1$

Rule ⇒ $\frac{1}{2}x^2 + 1$

Check $f(3) = \frac{1}{2}(3)^2 + 1 \neq 10$

DOESN'T WORK

PATTERN	1	3	6	10
$-\frac{1}{2}x^2$	-0	-0.5	-2	-4.5
Linear	1 = b	2.5	4	5.5
1st Difference		1.5 = a	1.5	1.5

LINEAR ⇒ $ax + b$

Rule ⇒ $1.5x + 1$

COMBINING RULES ⇒ $\frac{1}{2}x^2 + \frac{3}{2}x + 1$ [15 MARKS]

49th term? $x = 48$ ⇒ $\frac{1}{2}(48)^2 + \frac{3}{2}(48) + 1 = 1225$ [5 MARKS]

Divide: $4x^3 - 7x^2 - 21x + 18 \div (x - 3)$

[10 MARKS]

$$
\begin{array}{r|l}
 & 4x^2 + 5x - 6 \\
x - 3 & 4x^3 - 7x^2 - 21x + 18 \\
 & \mp 4x^3 \pm 12x^2 \\
 & 5x^2 - 21x \\
 & \mp 5x^2 \pm 15x \\
 & -6x + 18 \\
 & \pm 6x \mp 18 \\
 & 0
\end{array}
$$

Factorise: (i) $12x^2 + 17xy - 5y^2$ QUADRATIC

$-3xy$

$(4x - y)(3x \quad 5y)$ ✓ [10 MARKS]

$+20xy$

(ii) $8x^3 - 27y^3$

Difference of 2 CUBES

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$= (2x - 3y)(4x^2 + 6xy + 9y^2)$ [10 MARKS]

Simplify each of these:

multiply top and bottom by x

(i) $\dfrac{\frac{1}{x} + 1}{\frac{1}{x} - 1} = \dfrac{1 + x}{1 - x}$ [10 MARKS]

FIRST FACTORISE

(ii) $\dfrac{y^2 + 7y + 10}{y^2 - 25} = \dfrac{(\cancel{y+5})(y+2)}{(y-5)(\cancel{y+5})} = \dfrac{y+2}{y-5}$ [10 MARKS]