L1 Algebra Trial #5

Q1. a) If $10x^2y \times b = 20x^5y^2$ what is b in terms of x and y ?

b) Show that $y = (x + 2)(x - 5) - (x + 3)^2$ is a line of gradient equal to –9.

c) What is $\frac{3}{x} + y$ written as a single fraction?

d) Two numbers add to 10. They also are different by ten. What are they?

e) Find solution(s) to: $\frac{10(x+7)}{x} + 3 = 2x$

f) 

The number of intersections has the pattern 1, 3, 6, 10, 15 … Give an equation for the intersections in terms of the number of lines.

Q2. a) What number which when square rooted after one is subtracted is equal to 8?

b) Find $k = a^2 - 3b$ if $a = {}^-2$ and $b = {}^-6$.

c) What numbers give a product that when multiplied by five after having three subtracted is more than 3?

d) Bill takes a number, raises it to the power of four, adds 10 and gets a result of 26. What was his original number?

e) If three red buttons weigh as much as 5 blue buttons, and four red buttons weigh 140 grams more than 2 blue buttons, what does a red button weigh?

f) A rectangle is 5 cm longer than it is high. A 1 cm border is added all the way around. The border has an area of 26 cm^2. What is the size of the rectangle inside?

Q3. a) If one factor of $x^2 + 8x + k$ is $x + 2$, then what is the other factor?

b) If k is such that $5^k = 125$ then what is 2^k equal to?

c) Show that $y = \frac{x^2 + 10x + 24}{2x + 8}$ when graphed gives a line.

d) Show that the parabola $y = 25x^2 + 30x + 19$ only reaches the line $y = 10$ once.

e) What number(s) to the power of four are twenty-five times that number squared?

f) Show that an odd number times the next consecutive odd number is one less than the even number between them squared.

L1 Algebra Trial #5 : Answers

Colours indicate the **approximate** point when Achieved, Merit and Excellence are reached.

Q1. a) $x^2 \times x^3 = x^5$ and $y \times y = y^2$ so $b = 2x^3y$

b) $y = (x + 2)(x - 5) - (x + 3)(x + 3) = x^2 + 2x - 5x - 10 - (x^2 + 3x + 3x + 9)$
$= x^2 - 3x - 10 - x^2 - 6x - 9 = -9x - 19$ form is $y = mx + c$ where m = −9

c) $\frac{3}{x} + y = \frac{3}{x} + \frac{xy}{x} = \frac{3 + xy}{x}$

d) $a + b = 10$ and $a - b = 10$ So $a = 10 + b$ from second equation.
putting into first, $10 + b + b = 10$, so $b = 0$, which gives $a = 10$. 0 and 10

e) $\frac{10(x + 7)}{x} + 3 = 2x$ $\frac{10 + 70}{x} = 2x - 3$ $10x + 70 = 2x^2 - 3x$
$2x^2 - 13x - 70 = 0$ $(2x + 7)(x - 10) = 0$ $x = 10$ or $\frac{-7}{2}$

f) Pattern increases by +2, +3, +4 so it is a quadratic, at half n^2 rate of +1
i = ½n² is 0.5, 2, 4.5, 8, … so too high by 0.5, 1, 1.5, 2 … which is ½n.
i = ½n² − ½n or i = ½ n(n − 1)

Q2. a) Solve: $\sqrt{x-1} = 8$ $x - 1 = 64$ $x = 65$ (must write equation first)

b) Find $k = a^2 - b$ if $a = -2$ and $b = -6$: $k = (-2)^2 - 3 \times -6 = 4 + 18$ $k = 22$

c) $3 < 5(x - 3)$ $3 < 5x - 15$ $18 < 5x$ $x > \frac{18}{5}$ or numbers more than 3.6

d) $x^4 + 10 = 26$ $x^4 = 16$ $x = 2$ or −2 his number was 2 or −2

e) 3r = 5b so b = ³/₅ r and 4r = 2b + 140 (need to use equations)
So 4r = 2(0.6 r) + 140 2.8 r = 140 r = 50

f) If the rectangle is x high, Area = $x(x + 5)$. Area with border = $(x + 2)(x + 7)$
$26 = (x + 2)(x + 7) - x(x + 5)$ $12 = x^2 + 9x + 14 - x^2 - 5x$
$26 = 4x + 14$, so $x = 3$ The rectangle is 3 cm by 8 cm

Q3. a) $x^2 + 8x + k = (x + 2)(x + 6)$ because the 8 = 2 + 6, so other factor is $x + 6$

b) $5^3 = 125$ so $k = 3$, which gives $2^k = 2^3 = 8$

c) $\frac{x^2 + 10x + 24}{2x + 8} = \frac{(x + 6)\cancel{(x + 4)}}{2\cancel{(x + 4)}} = \frac{x + 6}{2}$ so $y = \frac{1}{2}x + 3$, which is the form of a line

d) $25x^2 + 30x + 19 = 10$ $25x^2 + 30x + 9 = 0$ $(5x + 3)^2 = 0$
a squared quadratic has only one solution, repeated, at $x = \frac{-3}{5}$

e) Solve: $x^4 = 25x^2$ $x^4 - 25x^2 = 0$ $x^2(x^2 - 25) = 0$ $x^2 = 0$ or $x^2 - 25 = 0$
$x = 0$ or $(x - 5)(x + 5) = 0$ $x = 0$, 5 or −5

f) Let the first number be x. So that times the next odd number is $x(x + 2) = x^2 + 2x$
The even number between them is $x + 1$, so squared is $(x + 1)^2 = x^2 + 2x + 1$
We see that $(x + 1)^2 = x^2 + 2x + 1$ is one more than $x(x + 2) = x^2 + 2x$