L1 Algebra Trial #6

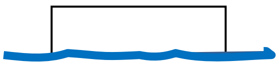
Q1. a) Jim thinks of a number. He takes twice that number away from eight, leaving a result of sixteen. What was his number?

b) If $p^6 = 125$, what is p^2 equal to?

c) Show that there is no value of k so that $11 - 3k \geq k + 8$ and $k > 1$ are both true.

d) What is b if there is only one solution to the equation $3x^2 + 6x = b$

e) If a stone follows a parabolic path so that it starts at $x = 0$ m, falls back to ground at $x = 20$ m and goes up to a height of 200 m, how high is it at $x = 2$?

f) 

A rectangular field is made with 36m of fencing alongside a river (which acts as the fourth side). If the area enclosed is 160 m^2, what are the dimensions of the field?

Q2. a) What is the highest common factor of $8x^2 - 20x$ and $2x^2 + x - 15$?

b) Find $S = \dfrac{a^2 + 4}{b}$ if $a = 6$ and $b = {}^{-}4$:

c) If $\dfrac{k^2 - 36}{a} = k + 6$ what must a be in terms of k?

d) What number after three is added and then squared is equal to 16?

e) Three small bags of chips weight 40 grams more than one large bag, and two large bags weigh 80 grams more than four small bags. How much do the bags weigh?

f) Write a rule for the linear pattern whose 10th and 15th terms are … 140, … , 95, …

Q3. a) what is the product of $4x^3$ and $\dfrac{1}{16x^5}$?

b) What are the x-intercepts of $y = (3x - 5)(2x + 5)$

c) How can $\dfrac{5}{x} + \dfrac{2}{y}$ be written as a single (fractional) term?

d) What is the equation $y = \sqrt{\dfrac{\pi}{x}}$ when written so that x is the subject?

e) Find two numbers 8 different where the larger squared minus the smaller is 118

f) Show that any odd number squared is always one more than a multiple of four and never one less than a multiple of four.
(*Hint: any odd number can be written as 2*n *+ 1, where* n *is an integer.*)

L1 Algebra Trial #6 : Answers

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

Q1. a) Solve: $8 - 2k = 16$ $\quad -2k = 16 - 8$ $\quad k = 8 \div {}^-2$ $\quad k = -4$ (need equation)

b) $p^6 = p^2 \times p^2 \times p^2$ $\quad$ as $125 = 5 \times 5 \times 5$ $\quad$ it follows that $p^2 = 5$

c) $11 - 3k \geq k + 8$ $\quad 11 - 8 \geq k + 3k$ $\quad 3 \geq 4k$ $\quad x \leq ¾$
which is not possible if $k > 1$

d) $3x^2 + 6x - b = 0$ $\quad 3(x^2 + 2x + b/3) = 0$ $\quad x^2 + 2x + b/3 = 0$
This has one solution when $x^2 + 2x + b/3$ is a square so the middle term ($2x$) has a coefficient double the end term ($b/3$) giving $(x + 1)^2$ so $b/3 = 1$ so $b = 3$

e) Form $y = x(x - 20)$ needs to go through (10, 200) so $y = {}^-2x(x - 20)$
Put in $x = 2$ into $y = {}^-2x(x - 20)$ gives $y = {}^-2 \times 2 \times (2 - 20)$ $\quad$ h = 72 m

f) Area = b × h. Let x be the h, then b = $36 - 2x$ $\quad$ Area = 160 = $x(36 - 2x)$
$160 = 36x - 2x^2$ $\quad (\div 2)$ $x^2 - 18x - 80 = 0$ $\quad (x - 10)(x - 8) = 0$
h = 8 or 10, use b = 36 – 2h $\quad$ The field is 8m × 20m or 10m × 16m

Q2. a) $4x^2 - 20x = 4x(2x - 5)$ $\quad 2x^2 + x - 15 = (2x - 5)(x + 3)$ $\quad$ so HCF is $2x - 5$

b) Find $S = \frac{a^2+4}{b}$ = if $a = 6$ and $b = {}^-4$: $\quad S = \frac{36+4}{-4} = \frac{40}{-4}$ $\quad S = -10$

c) $\frac{k^2 - 36}{a} = \frac{(k-6)(k+6)}{a}$ let $a = k + 6$, gives $\frac{\cancel{(k-6)}(k+6)}{\cancel{k-6}}$ so $a = k + 6$

d) Solve: $(x + 3)^2 = 16$ $\quad x^2 + 6x + 9 = 16$ $\quad x^2 + 6x - 7 = 0$
$(x + 7)(x - 1) = 0$ $\quad x = 1$ or ${}^-7$ $\quad$ (or solve via $x + 3 = \pm 4$)

e) 3S = L + 40 so L = 3S – 40 $\quad$ and 2L = 4S + 80 $\quad$ (need to use equations)
So 2(3S – 40) = 4S + 80 $\quad$ 6S – 4S = 80 + 80 $\quad$ S = 80
If S = 80, then 3 × 80 = L + 40 $\quad$ small = 80g and large = 200g

f) The multiplier × 5 = 95 – 140, so it is ⁻45 ÷ 5 = ⁻9 $\quad$ Solve $10 \times {}^-9 + c = 140$
The constant, $c = 140 + 90 = 230$ $\quad$ Rule is $t_n = {}^-9n + 230$ (or $t_n = 230 - 9n$)

Q3. a) $4x^3 \times \frac{1}{16x^5} = \frac{4x^3}{16x^5} = \frac{x \times \cancel{4x^3}}{4x^2 \times \cancel{4x^3}} = \frac{1}{4x^2}$ or $0.25x^{-2}$

b) $(3x - 5)(2x + 5) = 0$ when $x = \frac{5}{3}$ and $x = \frac{-5}{2}$ $\quad$ (x-intercepts $(\frac{5}{3}, 0)$ and $(\frac{-5}{2}, 0)$)

c) $\frac{5}{x} + \frac{2}{y} = \frac{5y}{xy} + \frac{2x}{xy} = \frac{2x + 5y}{xy}$

d) $y = \sqrt{\frac{\pi}{x}}$ $\quad y^2 = \frac{\pi}{x}$ $\quad \frac{1}{y^2} = \frac{x}{\pi}$ $\quad x = \frac{\pi}{y^2}$

e) $a - b = 8$ so $a = b + 8$ $\quad a^2 - b = 118$ $\quad (b + 8)^2 - b = 118$
$b^2 + 15b - 54 = 0.$ $\quad (b - 3)(b + 18) = 0$ $\quad$ (⁻18 < ⁻10 so not solⁿ) $\quad$ 11 and 3

f) $(2n + 1)^2$ where n is an integer = $4n^2 + 4n + 1 = 4(n^2 + n) + 1$
$4(n^2 + n)$ must be a multiple of 4, so any odd number squared is one more not less