L1 Algebra Trial #6

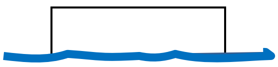
Q1. a) Solve: $8 - 2k = 5$

b) Solve: $x^3 = 125$

c) Solve: $11 - 3x \geq x + 8$

d) Solve: $\frac{14}{x+2} = x - 3$

e) If a stone follows a parabolic path so that it starts at $x = 0$ m, falls 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) Factorise: $4x^2 - 20xy$

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

c) Simplify fully: $\frac{k^2 - 36}{k - 6}$

d) Solve: $(x + 3)^2 = 16$

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 10^{th} and 15^{th} terms are … 140, … , 95, …

Q3. a) Simplify: $4x^3 \,.\, 2x^2 \div 16x^4$

b) Expand: $(x + 5)(2x + 4)$

c) Simplify to one fraction: $\frac{5}{x} + \frac{2}{y}$

d) Make x the subject: $y = \sqrt{\frac{\pi}{x}}$

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* 2n + 1, *where* n *is an integer.*)

L1 Algebra Trial #6 : Answers

In general terms: a) & b) are Achieved, c) & d) are Merit, e) & f) are Excellence

Q1. a) Solve: $8 - 2k = 5$ $\quad -2k = 5 - 8 \quad k = {}^{-}3 \div {}^{-}2 \quad$ $\boldsymbol{k = 1.5}$

b) Solve: $x^3 = 125$ $\quad$ $\boldsymbol{x = 5}$

c) Solve: $11 - 3x \geq x + 8$ $\quad 11 - 8 \geq x + 3x \quad 3 \geq 4x \quad$ $\boldsymbol{x \leq 3/4}$

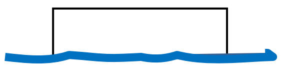
d) Solve: $\frac{14}{x+2} = x - 3$ $\quad 14 = (x - 3)(x + 2) \quad 14 = x^2 - x - 6$

$x^2 - x - 20 = 0 \quad (x - 5)(x + 4) = 0 \quad$ $\boldsymbol{x = {}^{-}4 \text{ or } 5}$

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

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) 

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?

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) Factorise: $4x^2 - 20xy$ $\quad$ $\boldsymbol{= 4x(x - 5y)}$

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

c) Simplify fully: $\frac{k^2 - 36}{k - 6}$ $\quad = \frac{(k-6)(k+6)}{k-6} = \frac{\cancel{(k-6)}(k+6)}{\cancel{k-6}}$ $\quad$ $\boldsymbol{= k + 6}$

d) Solve: $(x + 3)^2 = 16$ $\quad x^2 + 6x + 9 = 16 \quad x^2 + 6x - 7 = 0$

$(x + 7)(x - 1) = 0$ $\quad$ $\boldsymbol{x = 1 \text{ or } {}^{-}7}$ $\quad$ (or solve via $x + 3 = \pm 4$)

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?

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

The multiplier × 5 = 95 − 140, so it is $^{-}45 \div 5 = {}^{-}9$ $\quad$ Solve $10 \times {}^{-}9 + c = 140$

The constant, $c = 140 + 90$ $\quad$ **Rule is $\boldsymbol{t_n = {}^{-}9n + 230}$** (or $t_n = 230 - 9n$)

Q3. a) Simplify: $4x^3 . 2x^2 \div 16x^4$ $= \frac{8x^5}{16x^4} = \frac{x \times \cancel{8x^4}}{2 \times \cancel{8x^4}} = \boldsymbol{\frac{x}{2}}$ or $0.5x$

b) Expand: $(x + 5)(2x + 4)$ $= 2x^2 + 4x + 10x + 20$ $\quad$ $\boldsymbol{= 2x^2 + 14x + 20}$

c) Simplify to one fraction: $\frac{5}{x} + \frac{2}{y}$ $\quad = \frac{5y}{xy} + \frac{2x}{xy}$ $\quad = \boldsymbol{\frac{2x + 5y}{xy}}$

d) Make x the subject: $y = \sqrt{\frac{\pi}{x}}$ $\quad y^2 = \frac{\pi}{x} \quad = \frac{1}{y^2} = \frac{\pi}{x}$ $\quad$ $\boldsymbol{x = \frac{\pi}{y^2}}$

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

$a - b = 8$ so $a = b + 8$ $\quad a^2 - b = 118 \quad (b + 8)^2 - b = 118$

$b^2 + 15b - 54 = 0. \quad (b - 3)(b + 18)$ $\quad$ **11 and 3** $\quad$ ($^{-}18 < {}^{-}10$ so not sol^n)

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

$(2n + 1)^2$ 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