L1 Algebra Trial #1

Q1. a) Give the expression $\dfrac{12x^3}{4x^2}$ without a denominator.

b) Find the value of $K = (2x + 5)(x - 6)$ when $x = -3$.

c) Give a term equivalent to $\dfrac{5x - 15x^2}{10x^3}$ but with the denominator as simple as possible.

d) If $p^2 = 36x^2$, give an expression for p without a square root.

e) Rewrite the equation $2x = \dfrac{k}{k + k^2}$ to give k in terms of x.

f) The pattern 5, 11, 21, 35, … is given by the rule $t_n = 2n^2 + 3$.
Show that the difference between consecutive terms, starting at the n*th*, is 4n + 2

Q2. a) What number plus eight is equal to three minus that same number?

b) Find the gradient and y-intercept of the line $y = 4(x + 3) - 7(x - 2)$.

c) Show that $4x - 7 > 9x + 4$ is never true for positive numbers.

d) Find a solution to the equation $\dfrac{x + 1}{x + 3} = 5$.

e) If b is eight less than twice a and also six times a is b less than 2 what can we say about the values of a and b?

f) Find two numbers ten apart, so the one divided by the other is equal to one-fifth.

Q3. a) What is $3x^2 - 16x + 5$ as the product of two linear expressions?

b) The path of a dolphin jumping above sea level is given so height, h is given by the formula $h = -0.5(x + 3)(x - 2)$. For what distance is the dolphin above sea level?

c) For what values of x is $\dfrac{10}{2x^2 - x - 10}$ not able to be calculated?

d) What number multiplied by itself is equal to 50 more than five times that number?

e) What is the lowest possible value of a if $a = b^2 + 4b - 32$?

f) A rectangle has one side 6 cm longer than the other.
If the area (in cm²) is twice its perimeter (in cm), how long is the longer side?

L1 Algebra Trial #1 : Answers

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

Q1. a) $\dfrac{12x^3}{4x^2} = \dfrac{4 \times 3 \times x \times x \times x}{4 \times x \times x} = 3x$

b) $(2 \times {-3} + 5)({-3} - 6) = (-1) \times (-9)$ $K = 9$

c) $\dfrac{5x - 15x^2}{10x^3} = \dfrac{5x \times (1 - 3x)}{5x \times 2x^2} = \dfrac{1 - 3x}{2x^2}$

d) $p^2 = 36x^2$ so $p = \sqrt{36x^2}$ $p = \sqrt{36} \times \sqrt{x^2}$ $p = \pm 6x$ (A without $\pm$)

e) $2x = \dfrac{k\,(1)}{k\,(1 + k)}$ $2x = \dfrac{1}{1 + k}$ $1 + k = \dfrac{1}{2x}$ $k = \dfrac{1}{2x} - 1$ or $k = \dfrac{1 - 2x}{2x}$

f) The n*th* term and the next are $t_n = 2n^2 + 3$ and $t_{n+1} = 2(n + 1)^2 + 3$

diff $= t_{n+1} - t_n = [2(n + 1)^2 + 3] - [2n^2 + 3] = (2n^2 + 4n + 2 + 3) - (2n^2 + 3)$

diff $= 2n^2 + 4n + 2 + 3 - 2n^2 - 3$ diff $= 4n + 2$

Q2. a) $x + 8 = 3 - x$ $x + x = 3 - 8$ $2x = {-5}$ $x = {-2.5}$

b) $y = 4(x + 3) - 7(x - 2)$ $y = 4x + 12 - 7x + 14$ $y = {-3}x + 26$
So gradient is -3 and y-intercept is 26

c) ${-7} > 9x - 4x + 4$ ${-7} - 4 > 5x$ ${-11} > 5x$ $x < {-2.2}$ or $x < {-11}/5$
Which means all solutions are below -2.2, so no positive numbers make it true

d) Solve: $\dfrac{x + 1}{x + 3} = 5$ $x + 1 = 5x + 15$ ${-14} = 4x$ $x = {-3.5}$ or ${-7}/2$

e) $b = 2a - 8$ and $2 - b = 6a$ rewriting to $b = 2a - 8$ and $b = 2 - 6a$
$2a - 8 = 2 - 6a$ $8a = 10$ $a = 1.25$ $b = 2 \times 1.25 - 8 = {-5.5}$
They must be $a = 1.25$, $b = {-5.5}$

f) $\dfrac{x}{x + 10} = \dfrac{1}{5}$ $5x = x + 10$ $4x = 10$ $x = 2.5$
the numbers are 2.5 and 12.5   (must use equations)

Q3. a) $(3x - 1)(x - 5)$ or $(x - 5)(3x - 1)$

b) $-0.5(x + 3)(x - 2) = 0$ when $x = {-3}$ and 2, so the dolphin is above for 5 metres.

c) $\dfrac{10}{2x^2 - x - 10} = \dfrac{10}{(2x - 5)\,(x + 2)}$ so if $x = 2.5$ or -2 it is divided by zero

d) $x^2 = 5x + 50$ $x^2 - 5x - 50 = 0$ $(x - 10)(x + 5) = 0$ number is 10 or -5

e) $a = (b + 8)(b - 4)$ Parabola, lowest point is midway at $b = {-2}$, so $a_{min} = {-36}$

f) area $x(x - 6) = 2(x + x - 6 + x + x - 6)$ perimeter $x^2 - 6x = 8x - 24$
$x^2 - 14x + 24 = 0$ $x = 12$ or 2, but 2 not possible   long side = 12 cm