L1 Algebra Trial #2
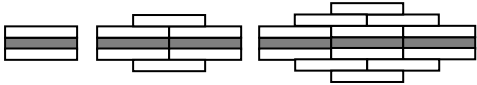
Q1. a) $(3x^{2.5})^4 = ax^b$ for what values of a and b?

b) What is the square root of $\dfrac{16}{x^2}$?

c) Give the expression $(8x^2 + 4x) \div (4x^3 + 12x)$ with no common factors.

d) Show that the value of $(3 + x)^2 - 2(x - 4) - (x + 2)^2$ is constant.

e) If a one two-scoop and one three-scoop ice-cream cost $5, and two two-scoop and three three-scoop ice-creams cost $12.75, how much does a two-scoop cost?

f)   Write an equation for w, the number of white blocks, in terms of g, the number of grey blocks.

Q2. a) What number if square rooted after two is added equals five?

b) Seven less than a number cubed is twenty. What is the number?

c) Sam lays out cubes in a rectangle twice as long as wide. If she lays them the same width by 10 blocks long she has 48 left over. How many blocks does she have?

d) Write k in terms of x if $\dfrac{8x^3}{k} = 2x$

e) The parabola $y = x^2 - 12x + 20$ has what as its minimum y value?

f) Bill sat two tests and scored an average of 16. If he doubled his score in the second test his average would have gone up to 19.5. What did he score in the first test?

Q3. a) What is the highest common factor of $6x^2y$ and $-3xy$?

b) Sixteen is two to what exponent?

c) Show that $\dfrac{x + 5}{x^2 + 3x - 10}$ can be written as a fraction with a numerator of 1.

d) A rectangle is x wide along one side and $2x + 3$ along the other. If the area is 65, how long is the shorter side?

e) What number divided by three is one-fifth more than itself divided by four?

f) A right angle triangle has a hypotenuse of 17.
    If the shortest side is 7 less than the other side, how long is the shortest side?

L1 Algebra Trial #2 : Answers

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

Q1. a) $(3x^{2.5})^4 = 3x^{2.5} \times 3x^{2.5} \times 3x^{2.5} \times 3x^{2.5} = 81x^{10}$ so $a = 81$ and $b = 10$

b) $\sqrt{16/x^2}$ $= \sqrt{16}/\sqrt{x^2}$ $= \dfrac{4}{x}$ or $4x^{-1}$

c) $= \dfrac{4x \times (2x + 1)}{4x \times (x^2 + 3)}$ $= \dfrac{2x + 1}{x^2 + 3}$

d) $(3 + x)^2 - 2(x - 2) - (x + 2)^2 = 9 + 6x + x^2 - 2x + 12 - (x^2 + 4x + 4)$

$= 9 + 6x + x^2 - 2x + 12 - x^2 - 4x - 4 = 17$ so the expression always gives 17

e) ② + ③ = 5 so ③ = 5 − ② and 2② + 3③ = 12.75 (need to use equations)

So 2② + 3(5 − ②) = 12.75 −1② + 15 = 12.75 ② = $2.25

f) Pattern 2, 6, 12, 20, so increases by +4, +6, +8 so it is a quadratic pattern

g^2 is 1, 4, 9, 16 so off by 1, 2, 3 etc, = g. so $w = g^2 + g$ or $w = g(g + 1)$

Q2. a) $\sqrt{x + 2} = 5$ $x + 2 = 25$ $x = 23$ number is 23

(needs equation – showing 23 is correct e.g. 23 + 2 = 25, $\sqrt{25} = 5$ is not enough)

b) Solve $x^3 - 7 = 20$ $x^3 = 27$ $x = 3$ number is 3 (must have equations)

c) Let w be the width, then $2w \times w = 10w + 48$ $2w^2 - 10w - 48 = 0$

$w^2 - 5w - 24 = 0$ $(w - 8)(w + 3) = 0$ $w = 8$ or 3 She has 8 × 16 = 128

d) $\dfrac{8x^3}{k} = 2x$ $\dfrac{8x^3}{2x} = k$ $k = 4x^2$

e) $y = (x - 2)(x - 10)$ so intercepts at $x = 2$ and 10. min in middle at $x = 6$

$y = 6^2 - 12 \times 6 + 20$ $y = {}^-16$

f) $\dfrac{a + b}{2} = 16$ and $\dfrac{a + 2b}{2} = 19.5$ so ① $a + b = 32$ and ② $a + 2b = 39$

② − ① gives $b = 7$ so first test = 25 (must have, and use, equations)

Q3. a) $6x^2y - 3xy = 3xy(2x + 1)$ so the highest common factor is $3xy$

b) Solve $2^x = 16$ $x = 4$ Exponent of 4

c) Simplify fully: $\dfrac{x + 5}{x^2 + 3x - 10}$ $= \dfrac{(x + 5)}{(x - 2)(x + 5)}$ $= \dfrac{1}{x - 2}$

d) Solve: $x(2x + 3) = 65$ $2x^2 - 3x - 65 = 0$ $(2x + 13)(x - 5) = 0$

$x = 5$ or $^-6.5$ −6.5 makes no sense, so the short side = 5

e) Solve: $\dfrac{x}{3} = \dfrac{1}{5} + \dfrac{x}{4}$ multiply through by 60 $\dfrac{60x}{3} = \dfrac{60}{5} + \dfrac{60x}{4}$

$20x = 12 + 15x$ $5x = 12$ $x = \dfrac{12}{5}$ (= 2.4)

f) Pythagoras gives $17^2 = x^2 + (x + 7)^2$ $289 = x^2 + x^2 + 14x + 49$

$2x^2 + 14x - 240 = 0$ (÷ 2 all through) $x^2 + 7x - 120 = 0$ $(x + 15)(x - 8) = 0$

$x = {}^-15$ or 8, but $^-15$ not possible short side = 8