

Eton 2016 King's Scholarship A Solutions

- 1) a) i) 2
 ii) $-2\frac{1}{2}$
- b) i) $1\frac{1}{5}$
 ii) $1\frac{11}{12}$
- c) i) $13 \times 10 = 130, 13 \times 0.1 = 1.3$ and the difference is 128.7
 ii) $\frac{12 \times 12.4 + 13 \times 9.9}{25} = 11.1$
- d) BDF=EDF=25 alternate angles
 DBF=DEF=25 isosceles triangles
 BFD=EFD=130 angles in triangle are 180
 X=100 degrees angles around a point are 360
- e) $x=2, y=-3$
- f) i) $A = lw$
 $B = 1.12l \times 0.9w = 1.008lw$
 So B is 0.8% larger than A.
 ii) 20%
- g) i) $2\frac{3}{4}$
 ii) $\frac{1}{2}$
- h) i) $-4q+6r$
 ii) $-2p$
- i) $64.5cm^2$
- j) i) $x > -2$
 ii) $x < \frac{1}{12}$
- k) $\left(\frac{x}{5} + 4\right) \div \frac{3}{5} = \frac{x+20}{3}$
 One works, as does any number one bigger than a multiple of 3:
 1,4,...,2014
 Which has the same number of numbers as 3,6,...,2016
 (by adding 2 to each number).
 Which has the same number of numbers as 1,2,...,672
 (by dividing each number by 3).
 So 672.
- 2) a) i) $90cm^2$
 ii) $55cm^2$ and $35cm^2$
- b) Let W be the midpoint of PQ and X be the point such that SUXV is a parallelogram.
 $Area SRQ = \frac{1}{2} area SRQP$
 $Area URQ = \frac{1}{2} area URQW = \frac{1}{4} area SRQP$
 So $area QUS = \frac{1}{4} area SRQP$
 Similarly $area VUP = \frac{1}{4} area SUXV$
 But $area SUWP = area URQW = area PWXV$ so $area SRQP = area SUXV$
 Hence result.
- 3) a) $\frac{1}{25}$ and 16

- b) $c = 1$
 c) $a \div (b \div (c \div d))$
 $(a \div (b \div c)) \div d$
 $a \div (b \div (c \div d))$
- 4) a) i) 50
 ii) 51
- b) If you take away 100 then the answer is 50, if you take away 1 then the answer is 51, if you take away a number between the two then the answer must be greater than 50 but less than 51, gradually increasing as the number moves from 100 to 1.
- c) If we take away 101 then the mean is 50.5, if we take away 1 then the average is 51.5. If we take away numbers from 101 down to 1 then the mean gradually increases. There is only one value which give a whole mean, which is 51, when we remove 51.
- 5) a) i) Odd. $x+y$ odd means one of them is odd and $e-o=o-e=o$
 ii) Even. $x+y$ even means both e or both o and $e-e=o-o=e$
- b) $x^2 - y^2$
- c) $x^2 - y^2 = 188$, where x is the side of the garden and y is the side of the pond.
 $(x + y)(x - y) = 188$
 By part a) both even or both odd.

| $x+y$ | $x-y$ | x | y |
|-------|-------|-----------|-----------|
| 188 | 1 | Not whole | Not whole |
| 94 | 2 | 48 | 46 |
| 47 | 4 | Not whole | Not whole |

So the area of the pond = $46^2 = 2116m^2$

- 6) a) 0111(1), 01(110)10, (010)10, 110, 0
- b) i) Each change adds/ removes two digits. We start with 1 digit (0) so only odd numbers of digits are possible.
- ii) Each change adds/ removes either two 1's or two zero's. We start with no 1's so can only have an even number of 1's at any stage. Similar argument means an odd number of zero's.