

Eton College King's Scholarship 2013 A Solutions

- 1) a) 4.2  
b) 11  
c) i)  $5\frac{13}{20}$   
ii)  $5\frac{1}{11}$   
d)  $-3x+4$   
e) i)  $a = 1\frac{2}{5}$   
ii)  $b = 2\frac{1}{2}$   
f) i) £3,450  
ii) Value in 2012 = £20,000. Value in 2014 = £19,550, so less.  
g)  $x=3, y=-1$   
h) i)  $(45 + 12 \times 4) - (36 + 4.45 \times 12) = £3.60$   
ii) 21  
i) i)  $x > -6$   
ii)  $x > \frac{2}{5}$   
j) i) 8cm  
ii)  $8.2^2 = 67.24, QR^2 + SR^2 = 1.8^2 + 8^2 = 67.24$   
k) i)  $\frac{4}{5}$   
ii)  $\frac{2q}{p}$
- 2) a)  $\frac{4}{3} \times \frac{5}{4} \times \frac{6}{5} \times \dots \times \frac{20}{19} \times \frac{21}{20} = \frac{21}{3} = 7$  (*diagonal cancellation*)  
n=2 gives a product of 70  
b) i) 1  
ii) 7  
iii) 70
- 3) a) i) EAC = 50 degrees by alternate angles with ACD.  
ii) CAB = 40 degrees (EAC – EAB)  
Triangle ABC is isosceles so ACB = 70 degrees.  
b) i)  $y=180-4x$   
ii) If x is greater than or equal to 45 degrees then y is less than or equal to zero.
- 4) a) i) 55  
ii)  $2\frac{1}{2}$   
b)  $17\frac{1}{2}$

- 5) a) 1111, 112, 121, 211, 22  
 b) The jump to get to stone 5 must have been one or two stones, so from stone 3 or 4.  
 c) To get to stone 3 there are 3 options: 111, 12, 21.  
 Number of options to stone 5 = no. of options to stone 3 + no. of options to stone 4  

$$= 3 + 5$$

$$= 8$$
  
 d) Similarly to part b) to get to stone 6 Oliver must have jumped on stone 4 or 5.  
 So the number of options = no. of options to stone 4 + no. of options to stone 5  

$$= 5 + 8 = 13.$$
  
 e) Fibonacci sequence:  
 Stone: 3, 4, 5, 6, 7, 8, 9, 10  
 Number of lists: 3, 5, 8, 13, 21, 34, 55, 89 so 89.

- 6) a) i) 6  
 ii) 210  
 iii) 15  
 b) i) 1  
 ii) n  
 c) If a and 6 are different sizes then the LCM is greater or equal to the larger one.  
 However, the HCF is less than or equal to the smaller one.  
 So  $a \cdot 6$  is not one.  
 d) Let the HCF = h.  
 $6 = mh$  for some m  
 $b = nh$  for some q, where p and q have no common factors.  
 LCM = mn.  
 So  $b \cdot 6 = mn$ .
- $h = 1, 2, 3$  or 6 (the factors of 6).
- If  $h = 1$  then  $m = 6$  and  $n = 1$ . So  $b = 1$ .  
 If  $h = 2$  then  $m = 3$  and  $n = 2$ . So  $b = 4$ .  
 If  $h = 3$  then  $m = 2$  and  $n = 3$ . So  $b = 9$ .  
 If  $h = 6$  then  $m = 1$  and  $n = 6$ . So  $b = 36$ .