

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 and $b = nh$ for some n, where n and m 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 $b = 36$.