Eton 2020 King's Scholarship A Solutions

1) a) $1\frac{1}{3}$

b) $\frac{3}{11}$

c) $1\frac{2}{5}$

2) a) 0.0114

b) 3000

c) 0.00000081

3) a) 550

b) 304.05

4) x=1

5) $x \leq -0.8$

6) $x = 11, y = 4$

7) 17.8

8) 32.5%

9) $134°$

10) $\frac{1017-9-2\times90}{3} = 828$

$\frac{828}{3} = 276$

So 375 pages

11)a) $PBS = SPB = 45°$ as ABC is isosceles.

So triangle PBS is isosceles and BS = x

$\frac{x^2}{2}$

b) Similarly area of APQ = $\frac{y^2}{4}$ (split APQ vertically)

c) $\frac{y^2}{4} + 2 \times \frac{x^2}{2} + xy = 225$

$\frac{16x^2}{4} + x^2 + 4x^2 = 225$

$9x^2 = 225$

$x = 5cm$

12)a) 6 edges

b) 8 vertices, 12 edges

c) 6 vertices, 12 edges

d) $\frac{12\times5+20\times6}{3} = 60$ vertices ('each vertex is counted 3 times'), and $\frac{12\times5+20\times6}{2} = 90$ edges ('each edge is counted twice')

13)a) $\frac{2x+2}{2} = x + 1$

b) $OB = OC - BC = x + 1 - 2 = x - 1$

c) $BD^2 = OD^2 - OB^2 = (x+1)^2 - (x-1)^2 = 4x$

d) $122\pi = \pi r$ (half of circumference)

$122 = r$

$122 = x + 1$

$x = 121$

$BD = 2\sqrt{x} = 2 \times 11 = 22$

14)a) $\frac{m}{6} = \frac{n}{11}$ $(both\ those\ things\ are\ 'one\ part'\ so\ 11m = 6n$

b) $\frac{m-3}{3} = \frac{n+14}{7}$ $so\ 7m - 21 = 3n + 42\ so\ 7m - 3n = 63$

c) $m = 42, n = 77$

15)a) $\frac{243}{1.2+1.5} = 90$

$90 \times 1.2 = 108m$

b) $\frac{243 \times 3}{1.2+1.5} = 270s$ until meet for the second time

$\frac{243}{1.2} = 202.5$

$270 - 202.5 = 67.5s$

c) 5c-1000