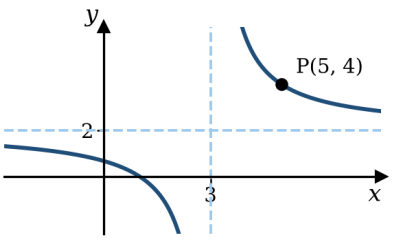
Day 68	A Level Maths: S Tier 10-a-day

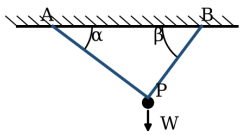
1 A school has 80 students in Year 10, 160 in Year 11 and 60 in the sixth form.
A stratified sample of 30 students is taken.
(a) Find the number sampled from each group.
(b) Two students are chosen at random from the sample. Find the probability they are from the same group.

2 Solve $3\cos 2\theta + 9\sin \theta + 3 = 0$
for $0 \leq \theta < 2\pi$, giving answers in terms of π.

3 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



4 A particle P of weight 45 N hangs in equilibrium from two light strings AP and BP attached to a horizontal ceiling at A and B (see diagram), where $\tan \alpha = \frac{3}{4}$ and $\tan \beta = \frac{4}{3}$.
Find (a) the tension in each string, (b) the greatest weight P could have if neither tension may exceed 76 N.



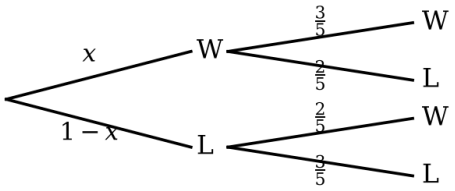
5 Find the remainder when x^8 is divided by $(x - 1)(x - 3)$.

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6 Particles A and B are projected from a point O at the same instant, with initial velocities $(18\mathbf{i} + 31\mathbf{j})$ m s^{-1} and $(14\mathbf{i} + 34\mathbf{j})$ m s^{-1} respectively (i horizontal, j vertically upwards).
Both are still in flight after 4 s. Find (a) the distance AB at this time, (b) the angle AB makes with the horizontal, to 1 d.p.

7 The tangent to $y = \frac{2}{x^2 + 3}$ at the point where $x = 3$
meets the axes at A and B. Find the exact area of triangle OAB,
where O is the origin.

8 The tree diagram shows two games played in turn.
Given the second is a W, P(first was a W) = $\frac{3}{11}$. Find x.



9 The line l has equation $\mathbf{r} = \begin{pmatrix} 2 \\ -3 \\ -2 \end{pmatrix} + t\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix}$.
The point P has coordinates $(-6, -7, 0)$.
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.

10 The sum of the first n terms of a sequence is $S_n = 4n^2 + 7n$.
(a) Find an expression for u_n.
(b) Find the least n for which $u_n > 311$.