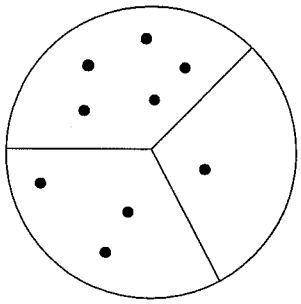
FINAL ASSESSMENT TASK EXTENSION 1 REVISION

1) Yr12-3U\furprob.cat Qn2) 3U99-6b

A coin is biased so that in any one throw there is a constant probability p (where $p \neq 0{\cdot}5$) that the coin shows heads. In *6* throws of the coin the probability of *3* heads is twice the probability of *2* heads. Find the value of p.

2) Yr12-3U\furprob.cat Qn3) 3U98-4c

Nine points lie inside a circle. No three of the points are collinear. Five of the points lie in sector *1*, three lie in sector *2*, and the other point lies in sector *3*.



i. Show that *84* triangles can be made using these points as vertices.

One triangle is closest at random from all the possible triangles.

ii. Find the probability that the vertices of the triangle chosen lie one in each sector.

iii. Find the probability that the vertices of the triangle chosen lie all in the same sector.

3) Yr12-3U\furprob.cat Qn4) 3U97-6c

It is known that *5%* of men are colour blind. A random sample of *20* men is chosen.

i. Find the probability, correct to two decimal places, that the sample contains at most one colour blind man.

ii. Find the probability, correct to two decimal places, that the sample contains at least two colour blind men.

4) Yr12-3U\furprob.cat Qn5) 3U96-6a

A group consisting of *3* men and *6* women attends a prize giving ceremony.

i. If the members of the group sit down at random in a straight line, find the probability that the three men sit next to each other.

ii. If *5* prizes are awarded at random to members of the group, find the probability that exactly *3* of the prizes are awarded to women if

α. there is a restriction of at most one prize per person.

β. there is no restriction on the number of prizes per person.

5) Yr12-3U\furprob.cat Qn6) 3U95-6b

Each time a competitor shoots at a target he has a probability *0·2* of hitting the target. He has *5* shots at the target. Find the probability that:

i. he hits the target on the first *3* shots and misses on the other two;

ii. he hits the target on *3* out of the *5* shots.

6) Yr12-3U\furprob.cat Qn7) 3U94-7a

An employer wishes to choose two people for a job. There are eight applicants, three of whom are women and five of whom are men.

i. If each applicant is interviewed separately and all of the women are interviewed before any of the men, find how many ways there are of carrying out the interviews.

ii. If the employer chooses two of the applicants at random, find the probability that at least one of those chosen is a woman.

7) Yr12-3U\furprob.cat Qn8) 3U93-6b

The letters of the word *CALCULUS* are arranged in a row.

i. How many different arrangements are there?

ii. If one of these arrangements is selected at random, what is the probability that it begins with '*U*' and ends in '*U*'?

8) Yr12-3U\furprob.cat Qn9) 3U90-7b

A die is loaded in such a way that in *8* throws of the die, the probability of getting *3* even numbers is four times the probability of getting *2* even numbers. Find the probability that a single throw of the die results in an even number.

9) Yr12-3U\furprob.cat Qn10) 3U89-7a

i. The letters of the word *PERSEVERE* are arranged in a row. How many DIFFERENT arrangements would be possible?

ii. Out of all the different arrangements found in (i) above, one is chosen at random. Find the probability that this particular arrangement:

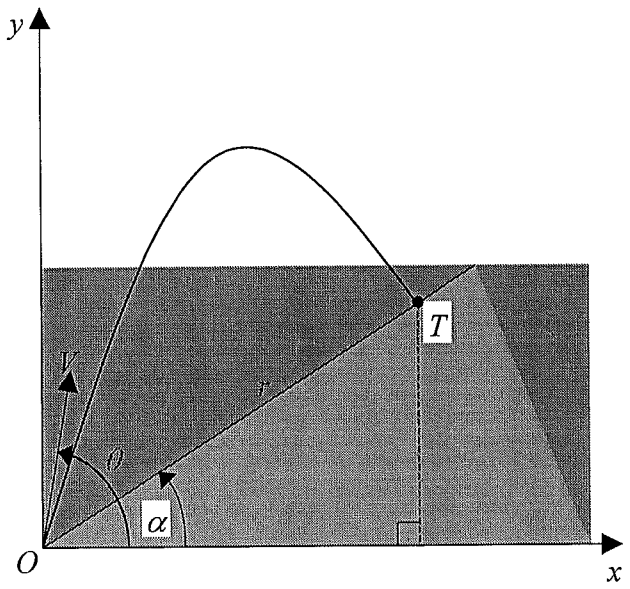
α. will have all the *E*'s together in one group AND all the *R*'s together in another group,

β. will have an '*E*' at one end and an '*R*' at the other end.

10) Yr12-3U\appworld.hsc Qn1) 3U00-4d

A particle is moving in simple harmonic motion about a fixed point *O*. Its amplitude is *3* cm and its period is 4π seconds. Find its speed at the point *O*.

11) Yr12-3U\appworld.hsc Qn2) 3U00-7b



The diagram shows an inclined plane that makes an angle of α radians with the horizontal. A projectile is fired from *O*, at the bottom of the incline, with a speed of V m s^{-1} at an angle of elevation θ to the horizontal, as shown. With the above axes, you may assume that the position of the projectile is given by $x = Vt\cos\theta$, $y = Vt\sin\theta - \frac{1}{2}gt^2$, where t is the time, in seconds, after firing, and g is the acceleration due to gravity. For simplicity we assume that $\frac{2V^2}{g} = 1$.

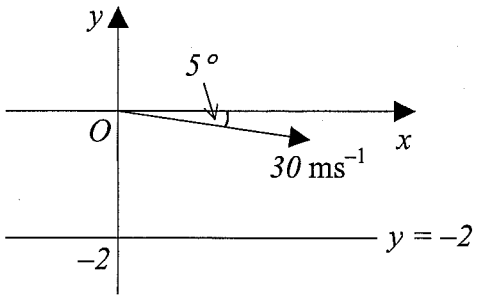
i. Show that the path of the trajectory of the projectile is $y = x\tan\theta - x^2\sec^2\theta$.

ii. Show that the range of the projectile, $r = OT$ metres, up the inclined plane is given by $r = \frac{\sin(\theta-\alpha)\cos\theta}{\cos^2\alpha}$.

iii. Hence, or otherwise, deduce that the maximum range, R metres, up the incline is $R = \dfrac{1}{2(1+\sin\alpha)}$. [You may assume that $2\sin A\cos B = \sin(A+B) + \sin(A-B)$]

iv. Consider the trajectory of the projectile for which the maximum range R is achieved. Show that for this trajectory, the initial direction is perpendicular to the direction at which the projectile hits the inclined plane.

12) Yr12-3U\appworld.hsc Qn4) 3U99-7a



A cricket ball leaves the bowler's hand 2 metres above the ground with a velocity of 30 ms^{-1} at an angle of $5°$ below the horizontal. The equations of motion for the ball are: $\ddot{x} = 0$ and $\ddot{y} = -10$.

Take the origin to be the point where the ball leaves the bowler's hand.

i. Using calculus, prove that the coordinates of the ball at time t are given by

$$x = 30t\cos(5°), \text{ and}$$
$$y = -30t\sin(5°) - 5t^2.$$

ii. Find the time at which the ball strikes the ground.

iii. Calculate the angle at which the ball strikes the ground.

13) Yr12-3U\appworld.hsc Qn5) 3U98-3c

A particle moves in a straight line and its position at time t is given by $x = 1 + \sin 4t + \sqrt{3}\cos 4t$.

i. Prove that the particle is undergoing simple harmonic motion about $x = 1$.

ii. Find the amplitude of the motion.

iii. When does the particle first reach maximum speed after time $t = 0$?

[[End Of Qns]]

FINAL ASSESSMENT TASK EXTENSION 1 REVISION

[Answers]

«1)→ $\frac{3}{5}$ »

«2)→ i) Proof ii) $\frac{5}{28}$ iii) $\frac{11}{84}$ »

«3)→ i) $0{\cdot}74$ ii) $0{\cdot}26$ »

«4)→ i) $\frac{1}{12}$ ii) α) $\frac{10}{21}$ β) $\frac{80}{243}$ »

«5)→ i) $0{\cdot}00512$ ii) $0{\cdot}0512$ »

«6)→ i) 720 ii) $\frac{9}{14}$ »

«7)→ i) 5040 ii) $\frac{1}{28}$ »

«8)→ $\frac{2}{3}$ »

«9)→ i) 7560 ii) α) $\frac{1}{63}$ β) $\frac{2}{9}$ »

«10)→ $\frac{3}{2}$ cm/s »

«11)→ Proof »

«12)→ i) Proof ii) $t = 0{\cdot}423$ secs (to 3 d.p) iii) $13°$ (to nearest degree) »

«13)→ i) Proof ii) 2 iii) $t = \frac{\pi}{6}$ »