CHASING A STAR

A-LEVEL MATHS QUESTIONS

Mechanics and Statistics - Day 4

COMPLETE ALL QUESTIONS

1.Calculator check time!

1. Let $X \sim N(10, 9)$. Using your calculator, ensure that you can get

$$P(7 < X < 13) = 0.68269$$

2. Let $Y \sim B(10, 0.2)$. Using your calculator, ensure that you can get

$$P(Y = 3) = 0.20133$$

3. Let $Y \sim B(10, 0.2)$ Using your calculator, ensure that you can get

$$P(Y \leq 3) = 0.87913$$

I've checked each of these repeatedly. Each of these results can be achieved using the NormalCD, BinomialPD and BinomialCD functions with appropriate bounds. Ensure you can use your calculator optimally!

2.A particle of mass 3kg lies on an inclined plane, which makes an angle of 20 degrees to the horizontal. The coefficient of friction is $\mu = 0.1$. Given that the particle is initially at rest, find its velocity after 5 seconds.

3. It is believed that the weight of tinned vegetables is normally distributed, with a mean of 454g and a standard deviation of 2g. A sample of 30 tins is taken, and their mean is found to be 452g. Determine if there is evidence at a 5% of a decrease in the mean weight of the tins, stating your null and alternate hypotheses clearly.

4. A bag contains 15 balls, 10 green, three blue and 2 red. Two balls are selected, without replacement. Find the probability that

1. They are both the same colour
2. The second is blue given the first is green
3. neither ball is green

5. The position of a particle is given by

$$\underline{r}(t) = \begin{pmatrix} t^3 - 2t^4 \\ 1 + t^2 \\ 6 - 4t^2 \end{pmatrix}$$

Determine the velocity when $t = 4$.

6. A particle of mass 3kg, on a smooth surface, is subject to a force of $(3\underline{i} + 2\underline{j})N$ for a period of 10 seconds. Given that the particle was initially at rest, determine it final velocity and the distance of the particle from its initial position.