

Big tournament statistics for A Level

A Level Math Revision · A Level Maths (Year 12 and Year 13) · Student sheet

Name _____

Class _____

Date _____

The starter is non-calculator. A calculator with statistics functions is needed.

Starter (5 minutes)

1. Find the mean of 2, 4, 4, 5, 10.
2. Ten values have $\Sigma x = 146$. Find the mean.
3. $X \sim B(4, \frac{1}{2})$. Find $P(X = 2)$.
4. $Z \sim N(0, 1)$. Write down $P(Z < 0)$.

Main activity (35 minutes)

Task A: Shots and goals

Made-up data for ten teams. Shots on target x : 12, 15, 9, 20, 17, 11, 14, 22, 8, 18. Goals y : 4, 5, 2, 8, 6, 3, 5, 9, 2, 6.

- a. Find the product moment correlation coefficient, to 3 significant figures.
- b. Find the regression line of y on x , with coefficients to 3 significant figures, and interpret the gradient.
- c. (Year 13) Test at the 5% level whether there is positive correlation between shots on target and goals. The critical value for $n = 10$ (one tail, 5%) is 0.5494.

Task B: Penalty shoot-out

In a made-up shoot-out, each of team A's five takers scores with probability 0.8 and each of team B's with probability 0.7, independently.

- a. Find the probability that team A scores all 5 penalties, to 3 significant figures.
- b. Find the probability that team A scores at least 4, to 3 significant figures.
- c. Each team takes all five penalties. Find the probability that team A scores more than team B, to 3 significant figures.

Task C: Race times

(Year 13) Made-up 100 m times are modelled by $T \sim N(10.2, 0.15^2)$ seconds.

- a. Find $P(T < 10.0)$, to 3 significant figures.
- b. Find the time that only the fastest 5% beat, to 3 significant figures.
- c. Eight sprinters run independently. Find the probability that at least one runs under 10.0 s.

Extension

1. A coach thinks the mean is 10.2 s but only 10% of times are under 10.0 s. Find the standard deviation this implies, to 3 significant figures.