Activity 1 Information sheet: Rolling averages

1. **How would increasing the number of data points in a rolling average of daily production rates have an impact upon:** 
   * **identification of the start and end of the peak production season**
   * **predicting potential material shortages during peak demand?**

Impact on identification of start and end of peak production season

* Smoothing effect
  + A larger number of data points in a rolling average creates a smoother curve. This means short-term fluctuations are less pronounced.
  + This can make it harder to pinpoint the exact day the peak season started or ended, as the transitions will appear more gradual.
  + Conversely, a smaller number of data points will create a more responsive rolling average, highlighting sudden changes more clearly.
* Trade-offs
  + While a smoother curve can reduce noise and provide a clearer overall trend, it can also delay the detection of turning points.
  + Therefore, a balance is needed. A very large window could cause a delay in detecting the start or end of the peak season. A very small window could give false signals.
* Practical application
  + For identifying broad seasonal trends, a larger window might be preferable.
  + For detecting rapid changes in production, a smaller window might be more suitable.

Impact on predicting potential material shortages during peak demand

* Trend stability
  + A larger rolling average provides a more stable trend, which can be useful for long-term predictions.
  + This can help in forecasting overall demand and identifying potential shortages well in advance.
* Reduced sensitivity to spikes
  + By smoothing out daily fluctuations, a larger rolling average can prevent overreactions to short-term spikes in demand.
  + However, it might also delay the recognition of a sustained surge in demand that could lead to material shortages.
* Early warning systems
  + To effectively predict material shortages, it’s essential to combine rolling average analysis with other data sources, such as inventory levels, supplier lead times and sales forecasts.
  + Using a combination of rolling averages with different window sizes can be very beneficial. A smaller window can show short-term spikes, and a larger window can show the overall trend.
* Proactive measures
  + The goal is to use the rolling average to identify trends that indicate increasing demand and then use that information to take proactive measures, such as increasing inventory or securing additional suppliers.

1. **How would a rolling average of the defect rate with a larger number of data points help identify a gradual increase in defects due to a slow-developing equipment malfunction?**

1. Smoothing out noise

* Reduced variability
  + Daily defect rates can fluctuate due to various random factors. These fluctuations, or ‘noise’, can obscure underlying trends.
  + A larger rolling average smooths out these fluctuations, providing a clearer picture of the overall trend.
* Highlighting the trend
  + By averaging over a larger window of data, the rolling average emphasises the long-term direction of the defect rate, making it easier to spot gradual increases.

2. Detecting gradual increases

* Trend identification
  + A slow-developing equipment malfunction might cause a subtle, but persistent, increase in the defect rate.
  + A larger rolling average can reveal this gradual increase, which might be missed if analysing daily fluctuations.

Example – Imagine a machine component slowly wearing down. Daily defect rates might show some variability, but a 30-day rolling average, for example, would reveal a gradual upward trend as the component deteriorates. This trend would be much clearer than if you were only looking at the daily defect rates, which might be obscured by random fluctuations.