A-Level Starter Activity

Jahwa Maths

Topic: Measures of Spread

Chapter Reference: Statistics 1, Chapter 2

6 minutes

1. Cotinine is a chemical that is made by the body from nicotine which is found in cigarette smoke. A doctor tested the blood of 12 patients, who claimed to smoke a packet of cigarettes a day, for cotinine. The results, in appropriate units, are shown below.

Patient	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
Cotinine level, x	160	390	169	175	125	420	171	250	210	258	186	243

You may use $\sum x^2 = 724\,961$

a. Find the mean and standard deviation of the level of cotinine in a patient's blood. **(4)**

b. Find the medium, upper and lower quartiles of these data. **(3)**

A doctor suspects that some of this patients have been smoking more than a packet of cigarettes per day. He decides to use $Q_3 + 1.5(Q_3 - Q_1)$ to determine if any of the cotinine results are far enough away from the upper quartile to be outliers.

c. Identify which patient(s) may have been smoking more than a packet of cigarettes a day. Show your working clearly. **(4)**

Solutions

1a.

Mean is $\frac{2757}{12}$	**M1**
$= 229.75$	**M1**
Standard Deviation = $\sqrt{\frac{724961}{12} - (229.75)^2}$	**M1**
$= 87.34045$	**M1**

1b.

Ordered list is: 125, 160, 169, 171, 175, 186, 210, 243, 250, 258, 390, 420 $Q_2 = \frac{1}{2}(186 + 210) = 198$	**M1**
$Q_1 = \frac{1}{2}(169 + 171) = 170$	**M1**
$Q_3 = \frac{1}{2}(250 + 258) = 254$	**M1**

1c.

$Q_3 + 1.5(Q_3 - Q_1) = 254 + 1.5(254 - 170)$	**M1**
$= 280$	**M1**
Therefore patients F(420)	**M1**
and B(390) are outliers.	**M1**