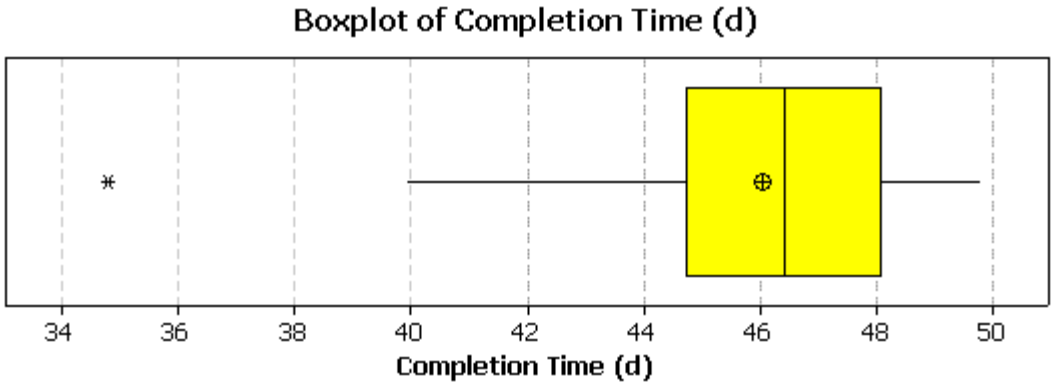
1) Observations of the times d (in days) for the completion of the same task by a sample of 54 contractors are summarized by the following Minitab® output:

Descriptive Statistics: Completion Time (d)

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Completion Time (d)	54	46.049	2.711	34.789	44.752	46.415	48.057	49.791



(a) State any ***two*** reasons to conclude that this sample is negatively skewed. [2]
(b) Is the outlier mild or extreme? *Show your working.* [4]
(c) Estimate, to the nearest day, the second shortest completion time. [2]
(d) Comment briefly on the outlier - is it a plausibly genuine observation? Why or why not? [3]

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2) Events A, B, C form a partition. A bookmaker offers the following odds:
r_A = 5:3 on, r_B = 1:1 ("even odds") and r_C = 7:1 against

(a) Show that the corresponding probabilities are not coherent. [4]
(b) If ten deposits of $10 are placed with the quoted odds as follows: [5]
five deposits on event *A*, four on event *B* and one on event *C*;
then what is the bookmaker's profit (or loss) if event C occurs?
(c) Rescale the three probabilities so that they are coherent. [3]
(d) Convert the coherent probabilities back into odds. [2]

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3) It is known that [8]
$\mathrm{P}[A]=.40,\quad \mathrm{P}[B]=.35,\quad \mathrm{P}[C]=.50,$
$\mathrm{P}[A\cup B]=.60,\quad \mathrm{P}[B\cup C]=.75,\quad \mathrm{P}[C\cup A]=.70$ and $\mathrm{P}[A\cup B\cup C]=.85.$
Find the probability that ***all*** of events A, B, C occur.

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continued ☞

4) A truck is carrying fifteen coils of cables, three of which are defective.
As a random sample, four coils are removed from the truck.

(a) Find the probability that none of the four coils is defective. [4]
Express your answer as a fraction reduced to its lowest terms ***and*** as a decimal correct to two significant figures.

(b) Write down the probability mass function $p(x)$ for X, the number of defective coils in the random sample. [3]

BONUS QUESTION

(c) Using $\mathrm{E}[X] = \sum_{x=x_{\min}}^{x_{\max}} x \cdot p(x)$, find an exact expression for $\mathrm{E}[X]$. [+4]

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E N D