1. This question proved to be quite challenging for a high proportion of candidates. A significant number either made no attempt at the question or offered very little in the way of creditable solutions, with many unable to progress beyond part (a). Time issues may have been a contributing factor in some cases.

The majority of candidates however, were able to earn some credit at least in part (a), for their standardisation, although whilst this was often completely correct, a fairly common mistake was to give 1 – 0.8944 = 0.1056 as their final answer.

Many students did not recognise that they needed to actually use the normal distribution in part (b) and part (c), giving rise to extremely poor attempts by numerous candidates. Of these, many merely gave 45 and 15 as their quartiles, whilst others calculated $\frac{3}{4}$ of some value as their upper quartile (for example $\frac{3}{4} \times 60$) and $\frac{1}{4}$ of the same value as their lower quartile. Alternatively, of those who understood that they were required to use the normal distribution, most attempts were successful, though there were some instances of their setting their standardisation equal to a probability, usually 0.75 or P(Z < 0.75), and not a z-value. Unfortunately 0.68 was used fairly frequently as the z value. The majority of candidates were however able to follow through their value of the upper quartile to find their lower quartile using symmetry, though some performed a second calculation involving standardisation. Some candidates miscalculated their lower quartile as $\frac{1}{3}$ of their upper quartile.

Despite previous errors most candidates tended to be successful in substituting their values correctly into at least one of the given formulae. However, a few seemed unaware of the order of the operations.

The final part of the question also proved difficult for many candidates with some running into trouble as a consequence of previous errors in part (b), part (c) and part (d) and others providing no attempt at all. Indeed, for numerous candidates, incorrect values for h and k led to probabilities of 0 being calculated from results such as P(Z > 7) and thus many creditable attempts lost marks through earlier inaccuracies.

2. Part (a) was usually answered well but the remaining parts of the question proved challenging for many. There was much muddled work in part (b) and although some scored M1B1 for attempts such as $\frac{154-\mu}{\sigma}$ = 1.6449 very few scored the A1cso for a completely correct derivation without any incorrect statements being seen. Those who fumbled their way to the printed answer in (b) usually came unstuck in part (c). A common error was to write $\frac{172-\mu}{\sigma}$ = 0.5244 and then replace he 0.5244 with 1 – 0.5244. Those with a correct pair of equations were usually able to solve them correctly to find μ and σ. Many attempted to standardise in part (d) but even those with correct answers in (c) often failed to score full marks either due to premature rounding or because they thought their final answer was 1 – 0.8212. Curiously even a correct diagram failed to prevent some of them from making this final error.

3. More able candidates made a good start to this question. Part (a) was well done and part (b) usually gained the method mark. Part (c) proved to be much more of a challenge despite it being very similar to questions set in previous papers on this topic. Many candidates gained 4 marks, and there were a number who could see what was required but could not quite answer fully, submitting solutions which had most of the components, but not in the right sequence. Many adjusted the sign, either losing it during the calculation, or right at the end when –50 did not appear to be correct. Many candidates did not use 0.8416, settling for 0.84. A few used a probability rather than a z value but this was less than in previous years. Some candidates drew diagrams to help their thought processes. In part (d) candidates lost marks as they were not confident in interpreting what their figures meant. Many candidates did not use correct statistical language and thus lost the marks, others commented on the standard deviation for Y being lower than that for X without considering the magnitude of the difference.

4. Most candidates tried this question and the standardisation in part (a) was usually correct but a small minority used 25 as the standard deviation. The majority found $P(Z < 1.8)$ correctly but some gave the answer as $1 - 0.9641$ and lost the second mark.

A clear diagram should have helped candidates with the next two parts for many gave answers to d and e where $d > e$. In part (b) many started correctly by calculating $1 - 0.1151$ and using the tables to find $z = \pm 1.2$. However only the more alert chose the minus sign and they usually went on to score full marks in both parts (b) and (c). There were good arguments using the symmetry of the normal distribution in both parts (c) and (d). Some candidates who made little progress with (b) or (c) were able to draw a simple diagram in (d) and obtain the correct answer from $1 - 2 \times 0.1151$.

5. Part (a) was answered with the highest degree of success with all but the weakest students not gaining 3 marks. Many candidates incorrectly interpreted the sign of the inequality in part (b) and went on to calculate a score above the mean. Many of those who arrived at an answer got circa 54 kg and failed to consider the reasonableness of their answer i.e. if the mean is 50kg, then 99% of the packets cannot weigh more than 54kg. Candidates often did not use the percentage points table quoting 2.33 instead of 2.3263 and this was reflected in the very small proportion of B marks awarded in part (b). Few candidates equated their standardised equation to a z-score with a consistent sign. Part (c) really sorted out those who really understood what was going on and who were hazily following the rules. Many failed to recognize that they only required the answer from part (a), a marked number specifically calculating the individual probabilities anew. The number who recognized that there was a factor of three involved was small although a significant number scored 2 marks by using $p^2(1 - p)$. Quite marked was the significant number who multiplied 0.0688 by two rather than squaring it. There was also a fair number who added the probabilities rather than multiplying.

6. Most candidates knew that mean = median for a normal distribution and wrote down the correct value, others obtained this by calculating (190 + 210)/2. In part (b) many were able to illustrate a correct probability statement on a diagram and most knew how to standardize but the key was to identify the statement $P(X < 210) = 0.8$ (or equivalent) and then use the tables to find the z value of 0.8416 and this step defeated the majority. Some used the "large" table and obtained the less accurate $z = 0.84$ but this still enabled them to score all the marks except the B1 for quoting 0.8416 from tables. In part (c) most were able to score some method marks for standardizing using their value of σ (provided this was positive!) and then attempting 1 - the probability from the tables. As usual the candidates' use of the notation connected with a normal distribution was poor: probabilities and z values were frequently muddled.

7. Part (a) was often done well but a substantial number omitted to subtract from 1; however most attempts standardised correctly with 4. The majority of candidates found part (b) required too much reasoning and either failed to add the 0.5 or got completely muddled in the use of the normal tables. A significant number did not understand the difference between a probability and a z value. A minority of candidates did not attempt this question.

8. Apart from the small minority who used σ^2 or $\sqrt{\sigma}$ in their standardisation, this part of the question was answered well. A common mistake in part (b) was to think that P($X < k + 100$) = 0.2090. The use of notation was often poor (with z values and probabilities often being equated) but many were able to find 0.7910 (from 1 – 0.2090) and often they also found $z = 0.81$ although a few rounded the 0.2090 to 0.20 and used $z = 0.8416$ from the table of percentage points. A number failed to standardize correctly and left the answer as $k = 112.5$ and others forgot that k was required to the nearest integer and left their answer as $k = 12.15$. Overall though this question was answered quite well.

9. It was unusual if a candidate scored 3 marks for the sketch. The mark for a bell-shaped curve was awarded to most candidates, but a particularly common problem was putting the value 1.65 on the wrong side of the sketch. Putting enough correct probabilities in the spaces was not

10. A straight forward Normal question answered well by some candidates and not so well by others. Part (d) proved a good discriminator between those who understood the meaning of independence and those who didn't, though some were sidetracked into trying to justify the assumption rather than questioning it with some strange results.

11. (a) This part of the question was generally well answered, with only a few candidates attempting to standardize with 3.5^2 or $\sqrt{3.5}$. Some candidates were unable to calculate the required probability once 0.9236 had been obtained. Occasionally a truncated value of z = 1.42 resulted in the final accuracy mark being lost.

(b) Many correct solutions were seen here.

(c) The majority of candidates seem to be unaware of the use of the percentage points table, and it was relatively rare to see z = - 0.5244. The common errors were to use the tables incorrectly and use a value of 0.6179 or simply to use 0.3 or 0.7.

12. The best candidates picked up full marks for this question. Generally part (a) and part (b) were answered well. There were many longwinded solutions to part (c) and quite a few confused responses to part (d) with confusion between z-scores and probabilities. Most candidates can standardise and find probabilities correctly, although some still use variance instead of standard deviation. Many candidates missed the simplicity of part (c) trying to over complicate it, and most of these never attempted part (d), perhaps not realising that they did not require part (c) for part (d).

13. A poorly answered question, with a significant minority having little if any familiarity with normal distributions. The sketch was nearly always the correct shape, although the four values of 66, 81, 0.0359 and 0.1151 were not always indicated on it. Some thought that a probability of 0.0359 corresponded to over one half of the area beneath the curve. Confusion between probabilities and z-values is still extremely common, The first z-value of -1.80 was often not found; 1.80 was common, with some candidates faking their standardisation equation to eventually obtain the given value of s = 5, whilst others were unable to obtain this value at all. Candidates were more successful in obtaining the second z-value of 1.20. Attempts at solving the simultaneous equations were usually satisfactory. It was surprising to see how many candidates used their incorrect value of s to calculate the value of μ. In part (c), the standardisation was usually done well by those candidates who reached this stage, with the correct answer frequently being obtained.

14. Parts (a) and (b) were extremely well answered by candidates; the value of 664 for S_{yy} was occasionally miscopied as 646 from part (a) to part (b). Candidates found it surprisingly difficult to obtain both marks in part (c), with a contextual relationship frequently being omitted. In part (d) the calculation of the mean was straightforward for nearly all candidates. Those candidates who were able to provide a correct formula also accurately found the standard deviation; however, too many candidates at this level were quoting an incorrect formula. Part (e) proved a good discriminator, with relatively few concise solutions; some candidates managed to obtain the correct value of *a* after a page or so of working. Only a handful of candidates were able to see that the number of press-ups is a discrete variable, whereas normal distributions are continuous.

15. The use of the Normal distribution appeared to be understood this year, but as before many of the candidates did not use the tables accurately in part (a). In spite of previous advice many candidates used a *z*-value of 0.84 instead of 0.8416 with consequent loss of marks. Part (b) was well answered but very few candidates could give a reasonable answer to the final part.

16. There were very few good descriptions of the properties of the Normal distribution. Many candidates made comments that were general to any continuous probability distribution rather than specific to the Normal distribution. A generous mark scheme allowed many candidates to score most of the marks in part (b) but many could not handle the use of tables to gain the final mark.

17. Standardising and using the Normal tables to find the required probability in part (a)(i) caused few problems. The need to multiply this probability by 30 to find the expected number of jars was well understood but too many candidates assumed that this value had to be an integer. This is not the case and they lost one of the available marks. A clear diagram would have made the candidates realise that the appropriate z-value needed in part (b) was negative, –2.3263, this value being found in the table on page 22 of the booklet of tables and formulae. This type of calculation is still not understood by many of the candidates.

18. Far too many candidates were unable to make an attempt at this question. A good clear diagram would have helped candidates to see what was required of them. The use of the Normal distribution tables was very poor and where an attempt was made candidates often used a probability instead of a z-value showing that they really did not understand the use of the Normal distribution. Of those who could answer the question too many did not give their final answer to 3 significant figures.

19. Generally a well answered question but insistence on the use of –1.2816 and –1.96 caused some candidates to lose marks since their solutions were not always well presented. Candidates should be encouraged to draw a diagram when answering questions on the normal distribution and also to use the negative part of the z-axis. In part (b) a percentage was asked for but many candidates ignored this and consequently lost an easy mark.

20. No Report available for this question.