1. The grouped frequency table shows information about the weights, in kilograms, of 20 students, chosen at random from Year 11.

Weight (w kg)	Frequency
$50 \leq w < 60$	7
$60 \leq w < 70$	8
$70 \leq w < 80$	3
$80 \leq w < 90$	2

There are 300 students in Year 11.

Work out an estimate for the number of students in Year 11 whose weight is between 50 kg and 60 kg.

……

(Total 3 marks)

2. The table shows the number of students in each year group at a school.

Year group	7	8	9	10	11
Number of students	190	145	145	140	130

Jenny is carrying out a survey for her GCSE Mathematics project.
She uses a stratified sample of 60 students according to year group.

Calculate the number of Year 11 students that should be in her sample.

.....

(Total 3 marks)

3. A school has 450 students.
Each student studies one of Greek or Spanish or German or French.
The table shows the number of students who study each of these languages.

Language	**Number of students**
Greek	145
Spanish	121
German	198
French	186

An inspector wants to look at the work of a stratified sample of 70 of these students.

Find the number of students studying each of these languages that should be in the sample.

Greek .....

Spanish .....

German .....

French .....

(Total 3 marks)

4. There are three age groups in a competition.
The table shows the number of competitors in each age group.

16-18 years	19-24 years	25+ years
120	250	200

John wants to do a survey of the competitors.
He uses a stratified sample of exactly 50 competitors according to each age group.

Work out the number of competitors in each age group that should be in his stratified sample of 50.

16-18 years: .....

19-24 years: .....

25+ years: .....

(Total 3 marks)

5. The table shows the number of boys and the number of girls in each year group at Springfield Secondary School.

There are 500 boys and 500 girls in the school.

Year group	Number of boys	Number of girls
7	100	100
8	150	50
9	100	100
10	50	150
11	100	100
Total	500	500

Azez took a stratified sample of 50 girls, by year group.

Work out the number of Year 8 girls in his sample.

.....

(Total 2 marks)

6.

	Male	**Female**
First year	399	602
Second year	252	198

The table gives information about the numbers of students in the two years of a college course.

Anna wants to interview some of these students.
She takes a random sample of 70 students stratified by year and by gender.

Work out the number of students in the sample who are male and in the first year.

.....

(Total 3 marks)

7. 258 students each study one of three languages.
The table shows information about these students.

	Language studied		
	German	**French**	**Spanish**
Male	45	52	26
Female	25	48	62

A sample, stratified by the language studied and by gender, of 50 of the 258 students is taken.

(a) Work out the number of male students studying Spanish in the sample.

.....

(2)

(b) Work out the number of female students in the sample.

.....

(2)
(Total 4 marks)

8. (a) Explain what is meant by

(i) a random sample,

.....

(ii) a stratified sample.

.....

(2)

The table shows some information about the members of a golf club.

Age range	Male	Female	Total
Under 18	29	10	39
18 to 30	82	21	103
31 to 50	147	45	192
Over 50	91	29	120
Total number of members			454

The club secretary carries out a survey of the members.

He chooses a sample, stratified both by age range and by gender, of 90 of the 454 members.

(b) Work out an estimate of the number of male members, in the age range 31 to 50, he would have to sample.

.....

(2)

(Total 4 marks)

9. Hamid wants to find out what people in Melworth think about the sports facilities in the town.
Hamid plans to stand outside the Melworth sports centre one Monday morning.
He plans to ask people going into the sports centre to complete a questionnaire.

Carol tells Hamid that his survey will be biased.

(i) Give **one** reason why the survey will be biased.

……...…….....

……....……

……....…

(ii) Describe **one** change Hamid could make to the way in which he is going to carry out his survey so that it will be less biased.

…….....

……....

……....

(Total 2 marks)

10. There are 970 students in Bayton High School.
Brian takes a random sample of 100 students.
He asks these 100 students which subject they like best.
They can choose English or Maths or Science.
Brian is going to use his results to work out an estimate of how many of the 970 students like English best.

Explain how.

.....

.....

.....

.....

(Total 2 marks)

11. The table shows some information about the pupils at Statson School.

Year group	Boys	Girls	Total
Year 7	104	71	175
Year 8	94	98	192
Year 9	80	120	200
Total	278	289	567

Kelly carries out a survey of the pupils at Statson School.
She takes a sample of 80 pupils, stratified by both Year group and gender.

(a) Work out the number of Year 8 boys in her sample.

…….

(2)

(b) (i) Explain what is meant by a random sample.

……

……

……

(ii) Describe a method that Kelly could use to take a random sample of Year 8 boys.

……

……

……

(2)
(Total 4 marks)

12. The table gives information about the number of girls in each of four schools.

School	A	B	C	D	Total
Number of girls	126	82	201	52	461

Jenny did a survey of these girls.
She used a stratified sample of exactly 80 girls according to school.

Work out the number of girls from each school that were in her sample of 80.
Complete the table.

School	A	B	C	D	Total
Number of girls					80

(Total 3 marks)

13. The table shows the number of boys in each of four groups.

Group	A	B	C	D	Total
Number of boys	32	43	38	19	132

Jamie takes a sample of 40 boys stratified by group.

Calculate the number of boys from group B that should be in his sample.

.....

(Total 2 marks)

14. The two-way table shows information about the number of students in a school.

	Year Group					Total
	7	**8**	**9**	**10**	**11**	
Boys	126	142	140	135	125	670
Girls	134	140	167	125	149	715
Total	260	282	307	260	276	1385

Robert carries out a survey of these students.
He uses a sample of 50 students stratified by gender and by year group.

Calculate the number of girls from year 9 that are in his sample.

.....

(Total 2 marks)

01. 105 3

$\frac{7}{20} \times 300$

M1 for either $\frac{7}{20}$ *oe or* $\frac{300}{20}$ *oe (condone slip in* Σf*)*

M1 for $\frac{7}{20} \times 300$ *oe (condone slip in* Σf*) or* $\frac{105}{300}$ *seen*

A1 cao

[3]

02. $\frac{130}{750} \times 60$

10 or 11 3

M1 130 / (190 + 145 + 145 + 140 + 130) (×100%)

M1 $\frac{130}{'750'} \times 60$ *or 17.3% × 60*

A1 10 or 11

[3]

03. $\frac{x}{450} \times 70$ 3

7, 18.8, 15.2, 28.9

= 7, 19,15, 29

M1 valid method

A2 all correct

(A1 2 or 3 correct)

SC unrounded: M1 A1 A0

[3]

04. $\frac{120}{570} \times 50 = 10.5263$

$\frac{250}{570} \times 50 = 21.9298$

$\frac{200}{570} \times 50 = 17.5438$

10

22

18 3

M1 method shown eg $\frac{120}{120 + 250 + 200} \times 50$ *or one of*

10.5(263) 21.9(298), 17.5(438)

or 570 ÷ 50 = 11.4 and one of 120 ÷ 11.4 = 10.526…) ,

270 ÷ 11.4 (= 21.9298…) , 200 ÷ 11.4 (= 17.5438…)

A1 for 10.5(263), 21.9(298), 17.5(438) or 11, 22, 18

B1 correction to add to 50: 10, 22, 18 or 11, 22, 17

[3]

05. $\frac{50}{500} \times 50 = 5$ 2

M1 for $\frac{50}{500} \times 50$ *oe*

A1 for 5

[2]

06. $\frac{399}{399+602+252+198} \times 70$

$= 19.24$

19 3

M1 for $\frac{399}{399+602+252+198}$ *or* $\frac{399}{1451}$ *or* $"\frac{70}{1451}"$ *or* $"\frac{1451}{70}"$ *or* $"\frac{1451}{399}"$

M1 $"\frac{399}{1451}" \times 70$ *or* $\frac{70}{"1451"} \times 399$ *or* $399 \div \frac{"1451"}{70}$ *(= 19.2487...)*

A1 for 19

[3]

07. (a) $\frac{26}{258} \times 50$

5 2

M1 for $\frac{a}{258} \times 50$ *or* $50 \div \frac{258}{a}$ *oe, a < 258 or 5.03(8...) or 26 ÷ 5.16*

A1 for 5 cao

(b) $\frac{(25+48+62)}{258} \times 50$

26 2

M1 for $\frac{135}{258} \times 50$ *or* $\frac{(25+48+62)}{258} \times 50$ *or* $\left(\frac{25}{258} \times 50 + \frac{48}{258} \times 50 + \frac{62}{258} \times 50\right)$ *oe or 26.1(6...) or 5 + 9 + 12 or 135 ÷ 5.16*

A1 for 26 or 27

[4]

08. (a) (i) 2

B1 for all have an equal chance

(ii)

B1 for selected in proportion to type

(b) 29 2

M1 for $\frac{147}{454} \times 90$ *or* $\frac{150}{450} \times 90$

A1 for 29 or 30

[4]

09. 2

B1 for reason (eg. Weekday morning, asking people using sports centre)
B1 for change (eg. Carry out a survey at different times of day, ask people in other locations)

[2]

10. Divide the no choosing Eng by 100
And then multiply by 970 2

B2 for both operations
(B1 for the initial fraction)

[2]

11. (a) 13 2

$\frac{94}{567} \times 80$

M1 for $\frac{94}{567} \times 80$

A1 cao

(b) (i) equal chance of selection names out of a hat, etc 2

B1 for valid definition

(ii)

B1 for valid method

[4]

12. $x \div 461 \times 80$
21.86, 14.22, 34.88, 9.02
22 14 35 9 3

M1 for $\frac{x}{461} \times 80$ *where x = 126, 82, 201 or 52*
A2 for all 4 correct
(A1 for 3 correct or all 4 as decimals rounded or truncated)

[3]

13. $\frac{43}{132} \times 40 = 13.03$
13 2

M1 for $\frac{43}{132} \times 40$ *oe or 13.03 seen*
A1 cao
Watch for 13 obtained from incorrect working

[2]

14. $\frac{167}{1385} \times 50$
6 or 7 2

M1 for $\frac{167}{1385} \times 50$ *or 6.02…… or 6.03 or* $\frac{1670}{277}$ *or* $6\frac{8}{277}$
A1 for 6 or 7

[2]

01. Paper 3

Many candidates obtained the first method mark by realising that $\frac{7}{20}$ of the students weighed between 50kg and 60kg or by dividing 300 by 20 to get 15. However, many then failed to complete their solution correctly. Again, poor arithmetic skills let down the weaker candidates. '$15 \times 7 = 100$', for example, was seen a number of times. Some candidates attempted to use mid-interval values.

Paper 5

The vast majority of candidates understood the method required to find an estimate for the number of students in the given weight interval. Although the arithmetical calculations "2100÷20" or "15×7" caused some candidates problems there were many correct solutions to this question.

02. There was clear evidence that candidates had difficulty doing this question because of its computational demands. In many cases the wrong total number of students was obtained, with 650 being common. It was very rare to see the expression $\frac{130}{750} \times 60$ followed by $\frac{7800}{750} = \frac{780}{75} = 10\frac{30}{75}$ giving a rounded answer of 10 or 11. A few students worked out that 60 was 8% of 750 and were able to reach 10.4 that way. Some others were able to divide 750 by 60 to get 12.5 and then try to divide 130 by 12.5 to get 10 (or 11). Few candidates demonstrated a knowledge that 750 ÷ 60 can be carried out by 75 ÷ 6.

03. This was a fairly standard and straightforward stratified random sampling question. Many candidates were able to find a suitable multiplier from 70 ÷ 450 or 450 ÷ 70. Of those that did, a few then left their answers as decimals and a few rounded to make their sample size greater that the required 70. Some candidates spotted the link between the 450 and the 45 to give 7 but were unable to follow this up successfully for the other values so did not show a complete method.

04. Now that this topic is well known and very familiar to higher tier candidates through the coursework, the success rate at this type of question has risen considerably. The most common response was to calculate expressions of the type $\frac{120}{570} \times 50$ and to adjust the answers so that the total sample size came to 50. Not all candidates adjusted the numbers to that total. Another approach was to convert the strata to percentages of the population and then to calculate the corresponding percentage of the sample size 50. Others worked out $\frac{570}{50} = 11.4$ but this was not as successful as candidates could not then sometimes decide what the significance was of the 11.4.

05. The majority of candidates were able to gain full marks for this question. A common error in calculation was $\frac{50}{500} = \frac{1}{2}$, leading to $\frac{1}{2} \times 50 = 25$; whilst a popular incorrect final answer was 50 (often stated without calculation).

06. There were a variety of methods used that led to a correct answer although over 75% of candidates failed to score any marks. Most candidates realised that they had to give their final answer as a whole number.

07. The most common pair of incorrect answers seen were 26 and 135 where candidates did not appreciate that the question involved a sample rather than the whole population shown in the two-way table.

Rather than carry out a single calculation, some candidates wrote down decimal or percentage values for fractions such as 26/258.

Premature rounding of these values occasionally led to inaccuracies but the necessity to have a whole number final answer usually rescued a potential loss of accuracy marks. A number of candidates assumed that part (b) also referred to the students studying Spanish and calculated 62/258 × 50 rather than use the 135 total of female students.

08. Few candidates were able to provide the correct definitions for a random and a stratified sample. The most common incorrect answers given were that a random sample was one 'without a strategy' and that a stratified sample was one 'with a strategy'. Of those candidates that were able to score marks in part (a) this generally came from the correct definition of a stratified sample. Few candidates recognised that a random sample was one where each item has an equal chance of selection. Part (b) was generally done well although too many candidates attempted to calculate an accurate answer rather than work out an estimate as requested.

09. This was another question where very many candidates gained full marks, usually with answers relating either to the location of the survey or the timing at which it took place. Failure to score here were when distracted by issues unrelated to bias, e.g. gender or the nature of the questions in the questionnaire.

10. The majority of candidates were able to describe accurately how they would estimate the number of students from the whole school who preferred English. A number of candidates were unable to express themselves clearly.

11. Part (a) was answered correctly by about 40% of the candidates. A common error in this question was to assume that the sample of 80 was the number of students in year 8 that should be sampled rather than the total number from the whole school. Thus, a common incorrect answer was 39. An incorrect method of solution was to simply divide 80 by 6 as there were six different categories of students. In part (b) very few candidates were able to give a correct definition of a random sample. Candidates had more success in describing how to take a random sample although a number of candidates just described how to generate random numbers on their calculator and did not relate this to the boys that would be selected for the sample. A common incorrect method of taking a random sample was to suggest that every *n*th boy should be selected.

12. Approximately three quarters of candidates gave a fully correct solution to this question. A number of candidates failed to gain any marks as their final answers were incorrect and no working was shown. Candidates should show their method as well as their uncorrected answers to be sure of gaining method marks, in the event that their final answers are not correct. The most common error made was to round the wrong values.

13. The stratified sampling either proved to be a well rehearsed routine or one that was challenging. Many accurate solutions in 47% of cases were seen which lead to the correct rounded answer of '13'. Some found it necessary to work out the sample sizes for each of the four groups, which, although it acted as a check, was also time consuming. They did, however, select the correct result as the final answer. For those less certain a trial and error approach was used in a minority of cases which they attempted to balance out the numbers from each group taking into account the number of boys in each group and aiming for a total of '40'. In many cases, weaker candidates offered 40 / 4 = 10 as their answer. Unfortunately, in about 6% of cases, premature rounding (i.e. 40/132 = 0.3 then 0.3 × 43 =12.9) cost candidates 1 of the 2 marks available.

14. Just under half of candidates gained some credit for their answers to this question. Either 6 or 7 were accepted for full marks. A surprising number of candidates worked out how many girls there should be in a sample of 50 year 9 students (27). Even more found how many girls there should be in a sample of 50 girls from the school (12) rather than meeting the requirement of the question. Absurd answers such as 167 were not uncommon.