1	$14 \div 10$ (= 1.4) **or** at least two of (3.2×15 (=48) or 3.6×5 (=18) or 0.6×10 (=6) or 0.2×20 (=4) **or** at least two of (140, 480, 180, 60, 40) **or** $\frac{14}{140} = \left(\frac{1}{10}\right)$		3	M1	for any one correct frequency density or $1cm^2 = 2.5$ or association of area with frequency eg one small square = 0.1 (on vertical axis)
	$14 + 3.2 \times 15 + 3.6 \times 5 + 0.6 \times 10 + 0.2 \times 20$ **or** $14 + 48 + 18 + 6 + 4$ **or** $(140 + 480 + 180 + 60 + 40) \times \frac{1}{10}$ **or** $900 \times \frac{1}{10}$			M1	for any correct method Allow one error in their total (error may include missing a total for a bar)
		90		A1	answer from correct working
					Total 3 marks

2 (a)	$35 \div 10$ (=3.5), $45 \div 15$ (=3), $75 \div 15$ (=5), $40 \div 20$ (=2), $(8 \div 10) = 0.8$		3	M1	for any two correct fd **or** two correct bars drawn of different widths
	$35 \div 10$ (=3.5) **and** $45 \div 15$ (=3) **and** $75 \div 15$ (=5) **and** $40 \div 20$ (=2) **and** $(8 \div 10) = 0.8$			M1	for all correct fd **or** at least 3 correct bars drawn
				A1	for a fully correct histogram with 'frequency density' (or fd) and scale on the axis labelled or appropriate key (SC: B2 for all five bars drawn of correct width with heights in the correct ratio) (SC: B1 for three bars drawn of correct width with heights in the correct ratio)
(b)	$10 \times 5 + 40 + 8$ or $\frac{2}{3} \times 75 + 40 + 8$		2	M1	ft from their histogram in (a) for a correct method
		98		A1	
					Total 5 marks

3	eg $5 \times 2x + 10 \times x = 160$ **OR** $160 \div 2$ (= 80) [freq of one bar] **OR** $40 \times 5 + 20 \times 10$ (= 400) [total no. of sml squares] **OR** $160 \div 16$ (= 10) [students per $1cm^2$] **OR** $1cm^2 = 10$ students **OR** **e.g.** 5 small squares = 2 students oe			M1	for setting up an appropriate equation **OR** finding the area of the 2nd or 3rd bar **OR** finding the total number of small squares **OR** for finding the number of students per $1cm^2$ **or** $1cm^2 = 10$ students **OR** other appropriate scale e.g. 5 small squares = 2 students
	'x' = 8 **OR** 8 or 16 seen in the correct position on the vertical scale **OR** $160 \div$ "400" (= 0.4 oe)			M1	for finding frequency density **OR** method to find the frequency of the 1st, 4th or 5th bar (1st is 108, 4th is 90, 5th is 12)
	"7.2" $\times 15 + 160 +$ "6" $\times 15 +$ "2.4" $\times 5$ **OR** $160 +$ "0.4" $\times (18 \times 15 + 15 \times 15 + 5 \times 6)$			M1	(dep on at least M1) for a complete method to find the total frequency (allow one error or one repeat but no omission)
		370	4	A1	
					Total 4 marks

4	(a)	$(0.7 \times 10) + (3.4 \times 5) + (1 \times 9) + (2.5 \times 6) + (4.8 \times 15)$ $= 7 + 17 + 9 + 15 + 72 (= 120)$ no. of sml squares = $(10 \times 7) + (5 \times 34) + (9 \times 10) + (6 \times 25) + (15 \times 48)$ $= 70 + 170 + 90 + 150 + 720 (= 1200)$ **or** all correct values in bars oe not added		3	M1	for a correct method to work out the total area eg total frequency or number of small squares or other correct method (allow one error in method) [count use of 25 for 24 as one error] **or** all correct values in bars oe not added
		$(1 \times 7) + (2.5 \times 6) + (5 \times 4.8) = 7 + 15 + 24 (= 46)$ or no. of sml squares $(48 \times 5) + (6 \times 25) + (7 \times 10) = 240 + 150 + 70 (=460)$			M1	for a correct method to work out the area between 17 minutes and 35 minutes eg using frequency density or number of small squares oe
		$\frac{46}{120}$	$\frac{46}{120}$		A1	for $\frac{46}{120}$ oe (allow 2 dp or better 0.3833... or 38% or better)
	(b)			2	M1	for $\frac{n}{15}$ where $n < 15$ or $\frac{q}{720}$ where $q < 720$ or $\frac{r}{72}$ where r < 72 or $\frac{9}{m}$ where $m > 9$ or $\frac{432}{p}$ where $p > 432$ $\frac{43.2}{t}$ where $t > 43.2$
			$\frac{9}{15}$		A1	$\frac{9}{15}$ oe
						Total 5 marks

5	(a)	eg height of first bar labelled as FD 4 **or** one 1 cm by 1 cm square = 5 people **or** 1 line of 5 small squares = 1 person **or** one 2cm by 2 cm square = 20 people etc		2	M1	for the use of frequency density – ie that area is proportional to frequency – with either a correct frequency density unambiguously labelled on axis **or** for an area representing a correct number of people **or** 2 correct frequencies completed
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	35, 39, 56		A1	All 3 correct
	(b)		Correct bar	1	B1	Width from 30 – 60 and height 1 cm
	(c)	0.5 × "56" + 30 (= 58) **or** 40 + "35" + "39" + "56" + 30 (= 200)		2	M1ft	follow through **their** stated value for $20 \leq d < 30$ for total greater than 25 or ft **their** 3 values in the table for total
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	$\frac{58}{200}$		A1ft	ft dep on a completed table oe eg $\frac{29}{100}$ **or** 0.29 **or** 29%
						Total 5 marks

6	E.g. $28 \div 2$ (= 14) **or** $1cm^2 = 2$ students		5	M1	for method to find the frequency density for the first bar **or** any correct value on the fd axis **or** can be implied by a correct frequency (30 or 24 or 36)
	2×20 (= 40) 1×30 (= 30) 1×24 (= 24) 3×12 (= 36) **or** 40, 30, 24, 36			M1	for method to find the missing frequencies (at least 3 correct)
	$1 \times 28 + 3 \times$ '40' $+ 4.5 \times$ '30' $+ 5.5 \times$ '24' $+ 7.5 \times$ '36' (= 685) or 28 + 120 + 135 + 132 + 270 (= 685)			M1	(indep ft) for a method to find the total (mid value × frequency) for at least **4** products using **their** values in the table (need not be evaluated) Allow consistent use of end points for at least **4** products which must be added
	'685' ÷ (28 + '40' + '30' + '24' + '36') (= 4.335...) or '685' ÷ 158 (= 4.335...)			M1	(dep on previous M1)
		4.34		A1	accept 4.33 - 4.34
					Total 5 marks

7	(a)	63 ÷ 1.5 (= 42) **or** a correct value written on FD scale (10 small squares = FD 10) **or** 10 squares = 1 parcel or 1 big square = 2.5 parcels oe eg area = $18 \times 5 + 15 \times 42 + 10 \times 24 + 10 \times 30 + 20 \times 8$ (= 1420) $3.6 \times 1 + 3 \times 8.4 + 2 \times 4.8 + 2 \times 6 + 4 \times 1.6$ (= 56.8) (at least 3 bars correct for any method of summing area)		3	M1	For use of area related to frequency eg showing a correct unambiguous value on the frequency density scale or calculating the area in some form
		$0.5 \times 18 + 63 + 1 \times 24 + 1 \times 30 + 2 \times 8$ (9 + 63 + 24 + 30 + 16) oe eg "1420" ÷ 10 or "56.8" × 2.5 oe			M1	Total of 5 frequencies with just one error or Area of bars with just one error, with correct calculation to give frequency
			142		A1	
	(b)	0.75 × 24 (= 18) + 30 + 16 (= 64) oe Eg "their (a)" – (9 + 63 + 0.25 × 24) (= 64) (ft figures from (a) dep on M1 for (a))		3	M1ft	(dep on M1 in (a))if working with small squares they may get eg $\frac{640}{1420}$
		$\frac{"64"}{142} \times \frac{"63"}{141}$ (ft their value of 142 from (a))			M1	64 must come from correct working allow $\frac{"64"}{142} \times \frac{"64"}{142}$ (ft their value of 142 from (a))
			$\frac{672}{3337}$		A1	0.201 or better (0.20137…)
						Total 6 marks

8	eg (7.5+2.5) − 6 = 4 large squares represents 8 trees **or** $5 \times 37.5 + 5 \times 12.5 - 10 \times 15 = 100$ small squares represents 8 trees 200 – 250 = 10 250 – 300 = 8 300 – 400 = 12 400 – 450 = 15 450 – 600 = 15 (or 450 – 500 = 5 or 500 – 600 = 10) 600 – 800 = 4		3	M1	oe eg 1 large square represents 2 trees **or** 12.5 small squares represents 1 tree **or** a frequency density axis scale where one large square vertically is FD of 0.04 with no contradictions **or** a correct frequency for any bar (could be seen on the diagram)
	$5 \times 2 + 2 \times 2$ **or** $\frac{10 \times 12.5 + 20 \times 2.5}{100} \times 8$ oe **or** $100 \times 0.1 + 200 \times 0.02$			M1	for a correct method to find the total number of trees greater than 500 cm.
		14		A1	
					Total 3 marks

9	10 ÷ 20 (= 0.5) or a correct value on the FD scale and no errors or 25 small squares = 5 children or 5 small squares = 1 child oe or 1 small square = 0.2 children oe or 29 oe or 48 oe or 10 (associated with 75-80 bar)		3	M1
	(10 × 2.9) + (15 × 3.2) + (5 × 2) or 29 + 48 + 10 or (5.8 + 9.6 + 2) × 5 oe or (145 + 240 + 50) × 0.2 oe			M1for a fully correct method
		87		A1
				Total 3 marks

10	16 ÷ 0.5 (= 32) or a correct value on the FD scale or 10 small squares =1 watermelon oe 25 small squares (1 large square) =16 ÷ 6.4 = 2.5 watermelon oe			M1 for use of area to represent frequency or one correct frequency from the 4 remaining bars
	15 × 1 + 16 + 23 × 1 + 30 × 1 + 12 × 1.5 **or** 15 + 16 + 23 + 30 + 18 **or** 16 + 0.1 × (15 × 10 + 23 × 10 + 30 × 10 + 12 × 15) oe **or** (150 + 160 + 230 +300 +180) × 0.1 oe **or** (6 + 6.4 + 9.2 + 12 + 7.2) × 2.5 oe			M1 (dep on M1) for a fully correct method, allow one error in products or number of squares but must be the sum of 5 parts
		102		A1
				Total 3 marks

11	at least **two** of 3, 8, 5, 2 seen **or** at least **two** correct frequency densities from 0.6, 0.8, 1, 1.2, 0.4 **or** eg one cm on FD axis = 0.25 **or** eg top of FD axis labelled 2 **or** eg 1 plant = 20 small squares **or** total small squares in at least 2 bars (60, 160, 100, 240, 40) **or** total number of 1 cm squares for at least 2 bars (2.4, 6.4, 4, 9.6, 1.6) oe		4	M1 At least 2 frequencies for other bars **or** scale on FD axis **or** eg 20 small squares represents 1 plant oe
	3 + 8 + 5 + 12 + 2 (= 30) **or** adding the number of small squares in all bars: 60 + 160 + 100 + 240 + 40 (= 600) **or** adding the number of 1 cm squares in all bars: 2.4 + 6.4 + 4 + 9.6 + 1.6 (= 24) oe			M1 add up 5 frequencies (allow one error) or adding the number of small squares in all bars (allow one error) or adding the number of 1 cm squares in all bars (allow one error) oe
	$\frac{0.25\times"12"+"2"}{"30"}$ **or** $\frac{0.25\times"240"+"40"}{"600"}$ **or** $\frac{0.25\times"9.6"+1.6}{"24"}$ **oe**			M1 ft their figures dep on the previous M1
		$\frac{1}{6}$		A1 oe eg $\frac{100}{600}$ allow 0.16(66…) ie 2 dp truncated or rounded or better
				Total 4 marks

12	(a)	$15 \div 15 (= 1)$ $18 \div 5 (= 3.6)$ $32 \div 20 (= 1.6)$ $4 \div 10 (= 0.4)$	Correct histogram	3	B3	for a fully correct histogram If not B3 then B2 for 3 correct frequency densities (can be implied by heights) or 3 correct bars drawn If not B2 then B1 for 2 correctly calculated frequency densities (can be implied by heights) or 2 correct bars drawn
						SC: award B2 for all 4 bars of correct width with heights in the correct ratio (eg drawn at 0.5, 1.8, 0.8, 0.2) **SC:** award B1 for 3 bars of correct width with heights in the correct ratio
	(b)	eg $\frac{15}{20} \times 32 (= 24)$ **or** $\frac{5}{20} \times 32 (= 8)$ **or** $\frac{15}{20} \times 32 + 18 (= 42)$ **or** $32 + 18 - \frac{5}{20} \times 32 (= 42)$		2	M1 ft	for a method to find an estimate for the number of students who took between 30 and 45 minutes **or** between 45 and 50 minutes **or** between 25 and 45 minutes ft incorrect histogram
		Correct answer scores full marks (unless from obvious incorrect working)	$\frac{42}{50}$		A1	oe eg $\frac{21}{25}$, 0.84, 84%
						Total 5 marks

13	(a)	FD are: 6, 7, 5, 4, 1.8		3	M1	For at least two frequency densities correct or at least two correct bars
					M1	For at least 4 correct frequency densities or 4 correct bars
		A fully correct histogram gains full marks	Correct histogram		A1	Fully correct histogram SCB2 for all five bars of correct width with heights in the correct ratio (eg drawn at 0.6, 0.7, 0.5, 0.4, 0.18) SCB1 for three bars of correct width with heights in the correct ratio

14	e.g. $20 \times 9 (= 180)$ or $20 \times 0.9 (= 18)$ or $20 \times 1.8 (= 36)$ or $(4 \times 25) + (4 \times 20) (= 180)$ oe or $4 \times 0.9 (= 3.6)$ or $4 \times 1.8 (7.2)$			4	M1	for a method to find the area of the 55 - 75 bar
	e.g. $5 \times 16 + 5 \times 50 + 10 \times 33 + 10 \times 19 + 25 \times 9 (= 1075)$ or $5 \times 1.6 + 5 \times 5 + 10 \times 3.3 + 10 \times 1.9 + 25 \times 0.9 (= 107.5)$ or $5 \times 3.2 + 5 \times 10 + 10 \times 6.6 + 10 \times 3.8 + 25 \times 1.8 (= 215)$ or $(3 \times 25 + 5) + (10 \times 25) + (12 \times 25 + 2 \times 15) + (6 \times 25 + 2 \times 20) +$ $(5 \times 25 + 5 \times 20) (= 1075)$ or $1 \times 1.6 + 1 \times 5 + 2 \times 3.3 + 2 \times 1.9 + 5 \times 0.9 (= 21.5)$ or $1 \times 3.2 + 1 \times 10 + 2 \times 6.6 + 2 \times 3.8 + 5 \times 1.8 (= 43)$				M1	for a method to find the total area **Using 5 bars** (products or areas) eg $80 + 250 + 330 + 190 + 225$ or $16 + 50 + 66 + 38 + 45$ allow one error or omission **Using 6 bars** (products or areas) eg $80 + 250 + 330 + 190 + 45 +$ "180" or $16 + 50 + 66 + 38 + 9 +$ "36" allow one error or omission
	e.g. $\frac{180}{1075} (\times 100)$ or $\frac{18}{107.5} (\times 100)$ or $\frac{36}{215} (\times 100)$ or $\frac{3.6}{21.5} (\times 100)$ or $\frac{7.2}{43} (\times 100)$ or $0.167(441\ldots) (\times 100)$				M1	for a method to find a fraction aged 55+ or percentage aged 55+ using all **correct** values only
	Correct answer scores full marks (unless from obvious incorrect working)		16.7		A1	awrt 16.7
						Total 4 marks

15	140 – (23 + 18 + 14) (= 85) **and** state the area of the 2 given bars, eg 34 (1 cm) squares or 8.5 large squares or 850 small squares oe **OR** 23 ÷ 5 (= 4.6 oe) **or** 18 ÷ 10 (= 1.8 oe) **or** 14 ÷ 20 (= 0.7 oe)		4	M1
	Use of frequency density for the given bars eg "85" ÷ 34 = 2.5 [(1 cm) square = 2.5 people] or "85" ÷ 8.5 = 10 [1 large square = 10 people] or "85" ÷ 850 = 0.1 [1 small square = 0.1 people] or 10 small squares = 1 person **OR** 23 ÷ 5 (= 4.6 oe) **and** 18 ÷ 10 (= 1.8 oe) **and** 14 ÷ 20 (= 0.7 oe)			M1 **or** 2 correct values in the table **or** 2 or 3 correct bars
	Correct answer scores full marks (unless from obvious incorrect working)	$5 < t \leq 15$ has frequency 25 $15 < t \leq 30$ has frequency 60 Bars of 4.6, 1.8, 0.7 correctly drawn to scale		A2 (A1 for **4** of $5 < t \leq 15$ has frequency 25 $15 < t \leq 30$ has frequency 60 bar of 4.6, bar of 1.8, bar of 0.7)
				Total 4 marks