Answers to Univariate Statistics Review Packet

1. (a) (i) 30   (A1) (C1)

        (ii) 32   (A1) (C1)

        (iii) 38 – 10 = 28   (A1)(A1) (C2)
               Note: Award (A1) for 10 and 38 seen, (A1) for correct answer only.

    (b) 0.25 × 56 = 14   (M1)(A1) (C2)
         Note: Award (M1) for multiplying 0.25 by 56

                                                                                       [6]

2. (a) 55   (A1) (C1)

        (i) $62.\overline{5}$ (62.6)   (A2)(ft) (C2)

        (ii) 8.86   (A1) (C1)
              Note: Follow through from their answer to part (a).

    (c) 62.6 – 3 × 8.86 = 36.0   (M1)(A1)(ft) (C2)
         Note: Accept 36.
         *Follow through from their values in part (b) **only if working is seen**.*

                                                                                       [6]

3. (a) $\dfrac{7+4+5+4+8+T+14+4}{8}=7$ (A1)(A1)
         Note: Award (A1) for sum +T, (A1) for 56 or 7 × 8 or 8 in the denominator and 7 seen.

         $T = 10$ (A1) (C3)

    (b) 4   (A1) (C1)
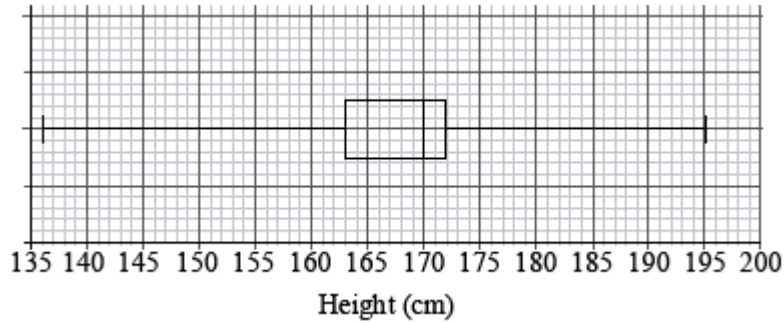
    (c) 4, 4, 4, 5, 7, 8, 10, 14   (M1)
         Note: Award (M1) for arranging their numbers in order.

         Median = 6   (A1)(ft) (C2)

                                                                                       [6]

4. (a) 170   (A1) (C1)

    (b) 163   (A1) (C1)

    (c) 172   (A1) (C1)

    (d)

Height (cm)

                                              (A1)(ft)(A1)(ft)(A1) (C3)

Notes: Award (A1)(ft) for correct median, (A1)(ft) for correct
quartiles and box, (A1) for correct end points of whiskers.
Award at most (A1)(A1)(A0) if lines go right through the box.

                                                                [6]

5. (a)

Grade	Frequency
1	**1**
2	**4**
3	(2)
4	**3**
5	(4)
6	**5**
7	(1)

                                                       (A2) (C2)

Note: Award (A1) for three correct.
Award (A0) for two or fewer correct.

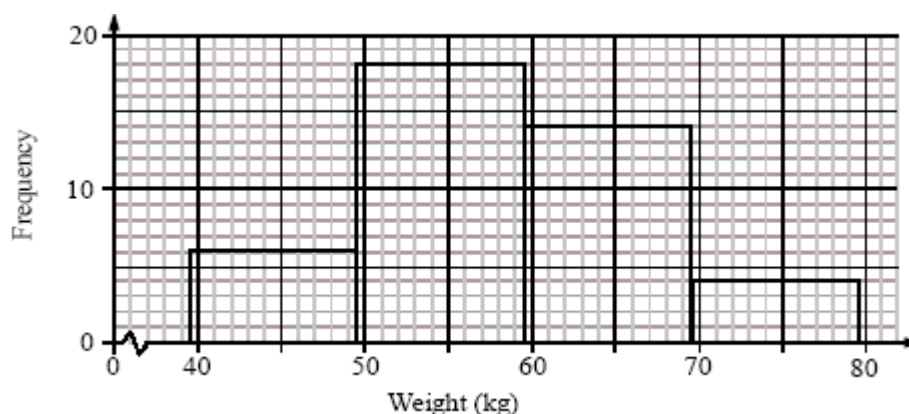   (b)   Mode = 6   (A1)(ft) (C1)

(c)   Median = 4.5   (M1)

> *Note: (M1) for attempt to order raw data (if frequency table*
> *not used)*   (A1)(ft)
> *or (M1) halfway between 10th and 11th result.*   (C2)

(d) $\dfrac{7}{20}$ (0.35, 35 %)   (A1)(ft)   (C1)

[6]

6.   *Unit penalty (UP) applies in part (c) in this question.*

(a)

(A1)(A1)   (C2)

> *Note: (A1) for all correct heights, (A1) for all correct end*
> *points (39.5, 49.5 etc.).*
> *Histogram must be drawn with a ruler (straight edge) and*
> *endpoints must be clear.*
> *Award (A1) only if both correct histogram and correct*
> *frequency polygon drawn.*

(b)   44.5   (A1)   (C1)

(c)   Mean = $\dfrac{44.5 \times 6 + 54.5 \times 18 + ...}{42}$ (M1)

> *Note: (M1) for a sum of frequencies multiplied by midpoint*
> *values divided by 42.*

UP   = 58.3 kg   (A1)(ft)   (C2)

> *Note: Award (A1)(A0)(AP) for 58.*

(d)   Standard deviation = 8.44   (A1)   (C1)
        Note: If (b) is given as 45 then award

        (b) 45   *(A0)*
        (c) 58.8 kg   *(M1)(A1)(ft) or (C2)(ft) if no working seen.*
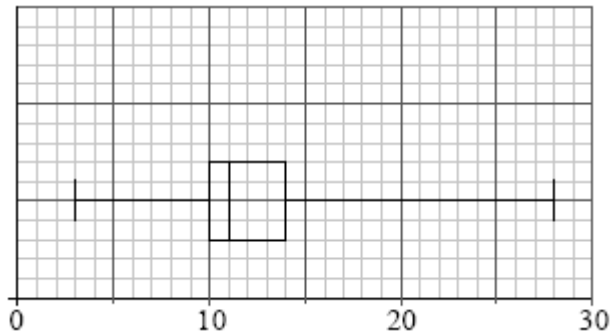   (d) 8.44   *(C1)*

                                                                                [6]

7.   *Unit penalty (UP) applies in part (a) in this question*

      (a)   Median = 11m   (A1)   (C1)

      (b)   Interquartile range = 14 – 10   (A1)
                              = 4   (A1)(ft)   (C2)
                    Note: (M1) for taking a sensible difference or for both correct
                    quartile values seen.

      (c)

             correct median   (A1)(ft)
             correct quartiles and box   (A1)(ft)
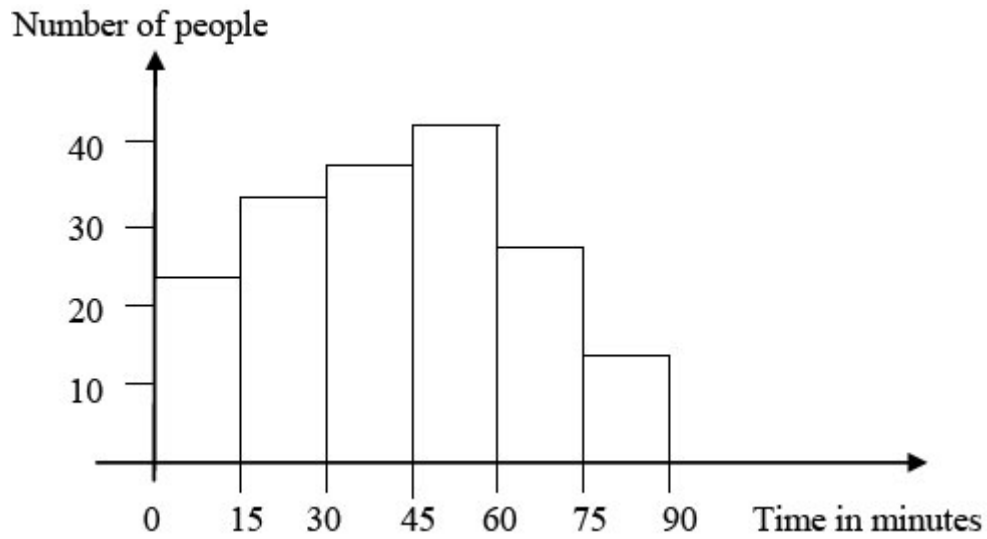   endpoints at 3 and 28, joined to box by straight lines   (A1)   (C3)
                    Note: Award (A0) if the lines go right through the box.
                    Award final (A1) if the whisker goes to 20 with an outlier at 28

                                                                                [6]

8.   *Unit penalty (UP) is applicable in question part (b) only.*

      (a) $45 \leq t < 60$ (A1)   1

      (b)   42.4 minutes   (G2)

UP   21.6 minutes   (G1)   3

(c)

Number of people

(A4)   4

[8]

9.   *Unit penalty (UP) is applicable in question parts (a) and (b) only*.

(a) $= \dfrac{83.6}{27}(=3.096296..)$ (M1)

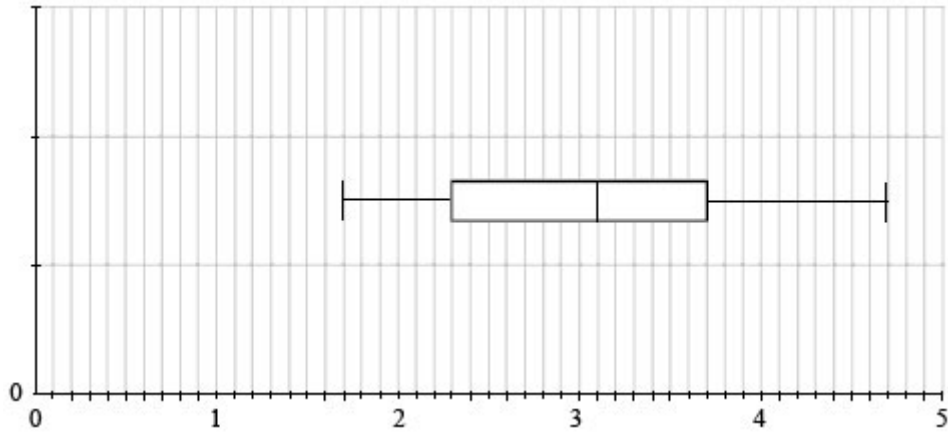**UP**   mean weight = 3.10 kg   *(accept 3.1 kg)* (A1)(C2)

(b)   (i)   median = 3.1 kg   (A1)

UP   (ii)   upper quartile = 3.7kg   (A1) (C2)

(c)

(A2)(ft)   (C2)

Note: (A1)(ft) for median and quartiles in correct place. (A1) for whiskers in correct place and joined to box with straight lines.

[6]

10.

$\bar{x}$ and σ	Team
I	B
II	C
III	D
IV	A

(A6)   (C6)

Note: Award (A6) for all correct, (A4) for 2 correct or for 3 correct and 1 blank, (A2) for 1 correct but (A0) if the same letter appears 4 times.

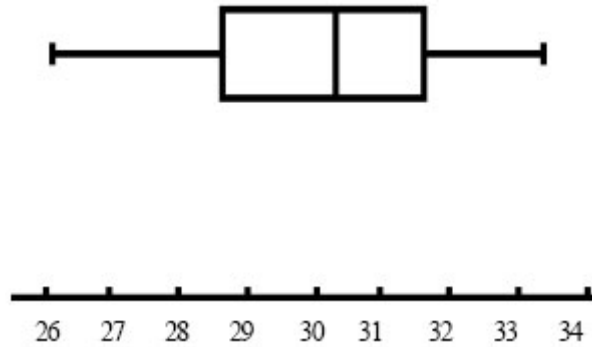**[6]**

11. (a) $\dfrac{2+t}{2}=3\Rightarrow t=4$ (M1)(A1)   (C2)

(b) q1 = 28.6 (A1)   (C1)

(c)

minimum = 26.1

maximum = 33.4   (A3)(ft)   (C3)

> *Note:* *Award (A1) for median in correct place, (A1) for box*
> *with quartiles in correct place and (A1) for correct whiskers*
> *joined to box with straight lines. The second (A1) follow*
> *through from (b).*

[6]

12. (a) (i)   95 – 6 = 89   (A1)

         (ii) 73 – 50 = 23   (A1)

         (iii) 60   (A1)   (C3)

   (b) (i)   62   (A1)

        (ii) 73 – 43 = 30   (A1)   (C2)

   (c) The girls as the IQR is larger   (R1)   (C1)

[6]

13.

Unsorted	
stem	leaf
16	976115
17	75337
18	043
19	5752

Sorted	
stem	leaf
16	115679
17	33577
18	034
19	2557

Key: 16│1 represents 161 cm

For sorted diagram attempt   (M2)

> ***Note:*** *For an unsorted diagram attempt award (M1) only.*

All entries correct   (A2)

> ***Note:*** *For one error in entries award (A1) only.*

For key   (A1)
For correct key with units   (A1)

[6]

14. (a) (i)   mean = 13.7   (M1)(A1) (G2)

        (ii)   sd = 2.52   (M1)(A1) (G2)

    (b)   For attempting to put their numbers in order   (M1)
             13.1   (A1) (G2)

[6]

15. (a)   109   (A1) (C1)

    (b)   60–120 thousand dollars   (A1) (C1)

    (c) $\dfrac{32}{109}$ For correct numerator   (A1)

                      For correct denominator   (A1) (C2)

    (d) $\dfrac{10}{39}$ For correct numerator   (A1)

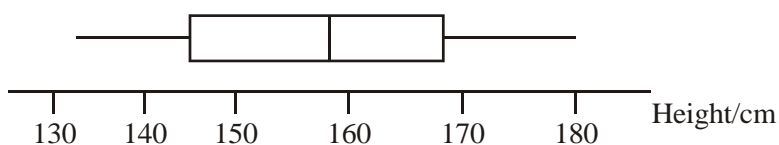   For correct denominator   (A1) (C2)

[6]

16. (a) (i)   145   (A1)

        (ii)   157   (A1)

        (iii)   167   (A1) (C3)

(b)   For median in correct place   (A1)
       For both quartiles in the correct places   (A1)
       For correct 2 whiskers   (A1) (C3)

                                                              Height/cm
    130   140   150   160   170   180

                                                                                          [6]

17. (a)   (i)   25 minutes (±2 minutes)   (A2)

              (ii)   Lower quartile = 18 (±1 minute)   (A1)
                     Upper quartile = 32 (±1 minute)   (A1)
                     Interquartile range = 32 – 18 = 14 minutes (±2 minutes) (A1)

                     OR

                     Accept [18 to 32] as interval for the interquartile range. (A3)   5

       (b) $p = 20$ (A1)
              $q = 30$ (A1)   2

       (c)

Midpoint	Frequency	M × f
2.5	20	50
10	20	200
17.5	20	350
22.5	40	900
30	60	1800
42.5	30	1275
55	10	550
(A1)	Total = 200	Total = 5125

                                                    (A1)

       Mean = $\dfrac{5125}{200}$ = 25.625 (exact) or 25.6 (3 s.f.)   (M1)(A1)

            Note: Not every step needs to be seen to get the marks.

       OR

       Mean = 25.625 or 25.6 (using GDC)   (G4)   4

                                                                                          [11]

18. (a)   6 hours (accept (5.5–6.5))   (A2) (C2)

(b) $$\dfrac{(4 \times 4 + 5 \times 5 + 6 \times 9 + 7 \times 8 + 8 \times 4)}{30}$$ (M1)(A2)(A1)

$$= \dfrac{183}{30}$$

$$= 6.1$$ (A2)   (C6)
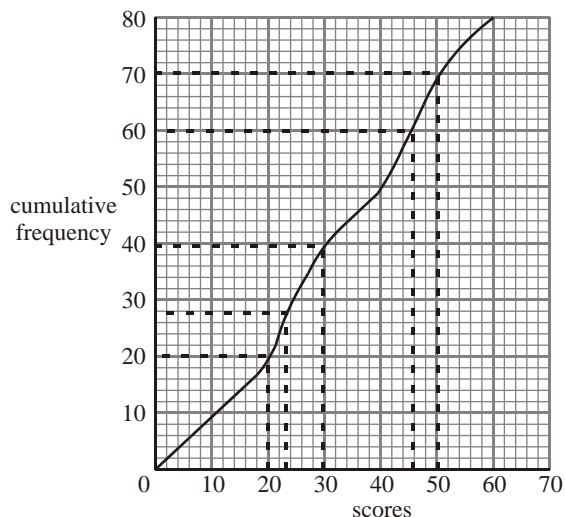
> **Note:** *Award (M1) for method, (A2) for all 5 terms in numerator correct.*
> *((A1) for 3 or 4 terms in the numerator correct), (A1) for denominator.*

[8]

19.   (a)   Modal group $= 170 \le h < 180$ (A1)   1

   (b)   Mean = 171   (G2)
         Standard deviation = 11.1   (G2)   4

   (c)   Median = 171 (± 1)   (A1)   1

   (d)   Lower quartile = 164.5 (± 1)   (A1)
         Inter-quartile range = 177.3 – 164.5 = 12.8   (A1)   2

   (e)   number = 52 (± 2)   (A1)
         percentage = $\dfrac{52}{200} \times 100 = 26\%$ (A1)   2

[10]

20.

   (a)   30   (A2)   (C2)

   (b) $P_{75} = 46$, $P_{25} = 20$ (M1)
         $46 - 20 = 26$ (A1)   (C2)

(c) $0.35(80) = 28$, $P_{35} = 23$ (A2)   (C2)

(d) $\dfrac{10}{80} = 12.5\%$ (A2)   (C2)

            Note: *Allow ±2 for each measurement.*

            Note: *Allow ft for (b), (c) and (d) if percentile scores were figured on the basis of 100 instead of 80.*

[8]

21.   (a)   63 kg   (A1)   1

    (b)   (i)   70.5 kg   (G1)
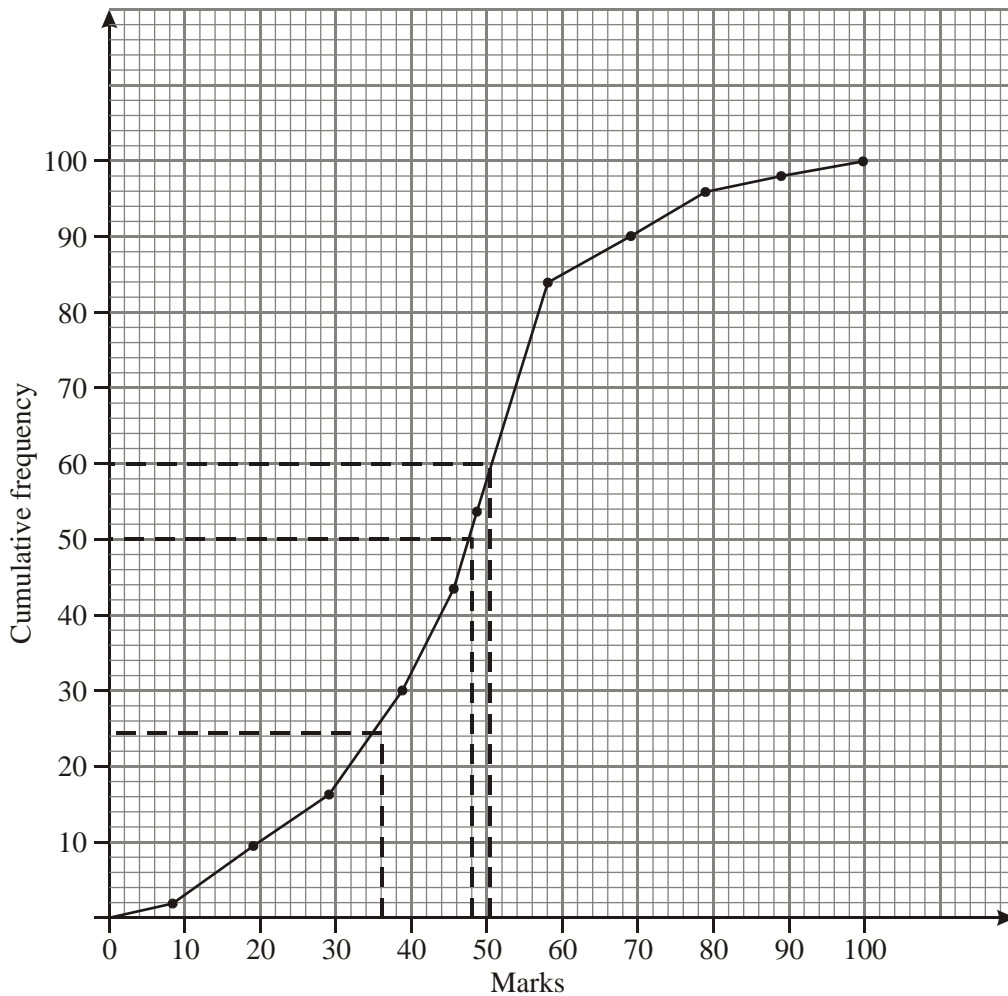
        (ii)   14.6 kg (also accept 15.2 kg)   (G1)   2

    (c)   Total weight of 12 students = 846 kg
        Total weight of 11 students = $11 \times 70 = 770$ kg   (M1)

        Weight of student who left = $846 - 770 = 76$ kg   (A1)   2

[5]

22. (a) $s = 17, t = 90$ (A1)(A1)   2

(b)   (M1)(M2)   3

Marks

Note: Award (M1) for both axes with correct scales and correctly labelled.
Award (M2) for 8, 9, 10 points plotted correctly, (M1) for 5, 6, 7 points plotted correctly, (M0) for 4 or less.
Accept a polygon or a curve.

(c) (i)   Median mark = 48 ($\pm$1)   (A1)

(ii)   Lower quartile = 36 ($\pm$1)   (A1)

(iii) Pass mark if 40% pass = 51 ($\pm$1)   (M1)(A1)   4
       Note: Follow through with candidate's own graph.
       Award (M0)(A1) ft if candidate correctly finds the grade (44) where 40% fail.

                                                                                                   [9]

23. (a) 30 (A1)

  (b) 6 (A1)

  (c) $\dfrac{1}{30}((3 \times 2) + (4 \times 4) + ... + (10 \times 1)) = 5.9$ (M1)

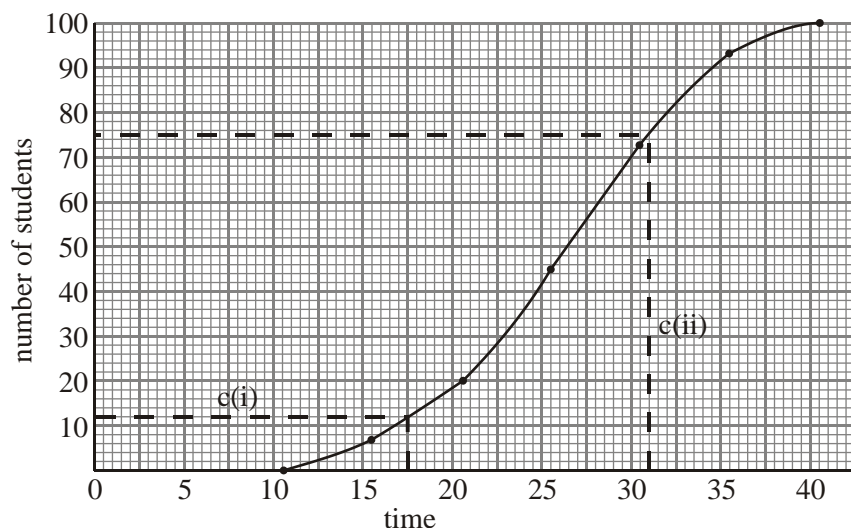 $= 6$ (nearest whole number) (A1)

  [4]

24. (a)

Time less than (mins)	Cumulative frequency
10.5	0
15.5	7
20.5	20
25.5	45
30.5	73
35.5	93
40.5	100

  (A2) 2

Note: Award (A1) for each correct column

  (b)

  (A3) 3

Note: Award (A1) for the correct scale and labelling.
Award (A2) for plotting 6 or 7 points correctly, (A1) for
plotting 4 or 5 points correctly.

  (c) (i) 12 ± 1 students (allow **ft**) (A1)

   (ii) 31 ± 0.5 minutes (allow **ft**) (A1) 2

  [7]

25. (a)   Interval 11–15   (A1)

       (b)   Mid-intervals 3, 8, 13, 18 ...   (M1)

                  Note: Award (M1) for all correct numbers.

           $\Sigma xf = 48 + 224 + 338 + ...$ (M1)

                  Note: Award (M1) for attempt to obtain sum.

           Mean = 13   (A1)

                                                                         [4]

26. (a)   Mean = $\dfrac{60}{10}$

                 = 6   (A1)   (C1)

       (b)   Mode = 2   (A1)   (C1)

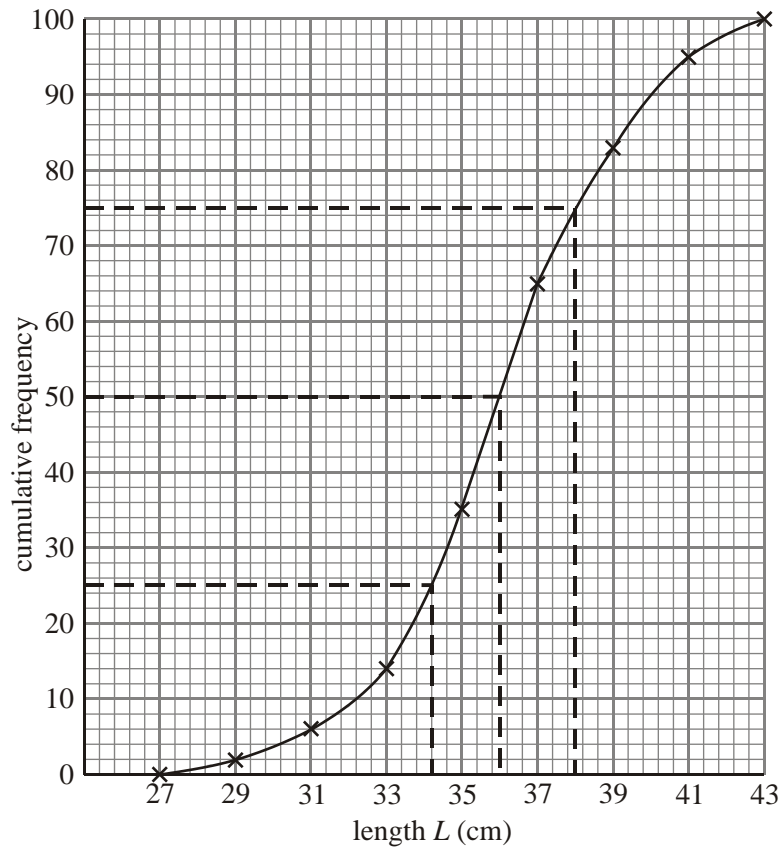   (c)   2, 2, 2, 4, 5, 6, 8, 9, 10, 12

                            ↑

           Median = $\dfrac{5 + 6}{2}$ (M1)

                 = 5.5   (A1)   (C2)

                                                                         [4]

27. (a)

L (cm)	f	Σf
≤ 29	2	2
≤ 31	4	6
≤ 33	8	14
≤ 35	21	35
≤ 37	30	65
≤ 39	18	83
≤ 41	12	95
≤ 43	5	100

                                                                (A2)   2

                  Notes: Award (A1) for four correct entries in the column headed
                  Σf.
                  Award (A2) for all 8 correct.

(b)

(A3)   3

Notes: Award (Al) for both axes and correct scale.

Award [½ mark] for each correctly plotted point and round up to a maximum of [2 marks].

(c)   (i)   Median length of mackerel = 36 cm ± 0.2 cm   (M1)
                                    = 36 cm   (A1)

      (ii)   Interquartile range of mackerel length = 3.8 ± 0.2 cm   (M1)
                                    = 4 cm   (A1)   4*

      (read from candidate's curve)

                                                                       [9]

28.   (a) $T = 50$ (A1)

          (b) $m = 19$ (A1)

          (c) $p = 9$ (A1)

          (d) $q = 43$ (A1)

                                                                       [4]