

| Q    | Answer   | Mark | Comments |
|------|----------|------|----------|
| 1(a) | diameter | B1   |          |

| Q    | Answer  | Mark | Comments |
|------|---------|------|----------|
| 1(b) | segment | B1   |          |

| Q    | Answer                          | Mark | Comments |
|------|---------------------------------|------|----------|
| 1(c) | tangent or circumference or arc | B1   |          |

| Q | Answer  | Mark  | Comments   |
|---|---|-------|--|
| 2 | Any two of<br>16 × 5 or 80<br>22 × 15 or 330<br>13 × 25 or 325<br>9 × 35 or 315                                       | M1    | implied by 1050  |
|   | (their 80 + their 330 + their 325 + their 315) ÷ 60   | M1dep | oe<br>must be sum of four numbers<br>condone missing final bracket |
|   | 17.5 or $\frac{1050}{60}$   | A1    | oe value eg $17\frac{1}{2}$  |
|   | <b>Additional Guidance</b>  |       |  |
|   | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |  |
|   | Ignore simplification or conversion attempt after correct answer seen   |       |  |
|   | Answer 17 or 18 with 17.5 seen  |       | M2A1   |
|   | 17.5 in working with $10 < v \leq 20$ on answer line  |       | M2A0   |
|   | 17.5 then answer doubled  |       | M2A0   |

| Q                   | Answer   | Mark | Comments  |
|---------------------|--|------|---|
| 3                   | 4 squares shaded so that the grid has exactly two lines of symmetry  | B2   | B1 4 squares shaded so that the grid has four lines of symmetry<br>or<br>even number of squares shaded so that the grid has exactly two lines of symmetry |
|                     | Additional Guidance  |      |   |
|                     | <div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div><div>or</div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div><div>or</div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div><div>or</div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div><div>or</div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div></div> <div>or</div> <div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div> <div>or</div> <div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div> <div>or</div> <div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div> |      | B2  |
|                     | <div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div><div>or</div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div></div>   |      | B1  |
|                     | <div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div><div>or</div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div><div>or</div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div></div>   |      | B1  |
|                     | <div><div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div></div>   |      | B0  |
|                     | Mark intention   |      |   |
| Part squares shaded |  | B0   |   |

| Q | Answer   | Mark | Comments  |
|---|--|------|---|
| 4 | <b>Alternative method 1</b>                        |      |   |
|   | $7 \times 4000 \div 100$ or 280                    | M2   | oe<br>M1<br>$7 \times 4000$ or 28000<br>or<br>$7 \div 100$ or 0.07<br>or<br>$4000 \div 100$ or 40                 |
|   | 280 and No   | A1   | oe eg 20 less and No  |
|   | <b>Alternative method 2</b>                        |      |   |
|   | $300 \times 100 \div 4000$ or 7.5                  | M2   | oe<br>M1<br>$300 \times 100$ or 30000<br>or<br>$300 \div 4000$ or 0.075<br>or<br>$100 \div 4000$ or 0.025         |
|   | 7.5 and No   | A1   |   |
|   | <b>Alternative method 3</b>                        |      |   |
|   | $300 \times 100 \div 7$ or 4285(.7... )<br>or 4286 | M2   | oe<br>M1<br>$300 \times 100$ or 30000<br>or<br>$300 \div 7$ or [42.8, 42.9]<br>or<br>$100 \div 7$ or [14.2, 14.3] |
|   | [4200, 4300] and No<br>with M2 seen                | A1   |   |

**Mark scheme and Additional Guidance continue on the next page**

|                   |   |      |    |
|-------------------|---|------|----|
| <b>4<br/>cont</b> | <b>Alternative method 4</b>   |      |    |
|                   | $7 \times 4000$ or 28000  | M1   | oe |
|                   | $300 \times 100$ or 30000   | M1   | oe |
|                   | 28000 and 30000 and No  | A1   |    |
|                   | <b>Alternative method 5</b>   |      |    |
|                   | $300 \div 4000$ or 0.075  | M1   | oe |
|                   | $7 \div 100$ or 0.07  | M1   | oe |
|                   | 0.075 and 0.07 and No   | A1   |    |
|                   | <b>Additional Guidance</b>  |      |    |
|                   | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |      |    |
|                   | No may be indicated by selecting the box or a statement in the working lines  |      |    |
|                   | No cannot be implied only by an inequality  |      |    |
|                   | A correct value is sufficient to show working eg 280 and No (except in alt 3)   | M2A1 |    |
|                   | 20 less in alt 1 implies M2   |      |    |

| <b>Q</b> | <b>Answer</b>                                 | <b>Mark</b> | <b>Comments</b> |
|----------|---|-------------|-----------------|
| <b>5</b> | $X$ is directly proportional to $\frac{1}{Y}$ | B1          |                 |

| Q | Answer  | Mark | Comments  |
|---|---|------|---|
| 6 | <b>Alternative method 1</b>   |      |   |
|   | $1.7^2 - 1.5^2 = 0.64$<br>and $\sqrt{0.64} = 0.8$<br><b>or</b><br>$2.89 - 2.25 = 0.64$<br>and $\sqrt{0.64} = 0.8$     | B2   | accept $0.8^2 = 0.64$ for $\sqrt{0.64} = 0.8$<br>accept $\sqrt{1.7^2 - 1.5^2} = 0.8$ for B2<br>accept $1.7^2 - 1.5^2 = 0.8^2$ for B2<br>B1 $1.7^2$ and $1.5^2$ oe |
|   | <b>Alternative method 2</b>   |      |   |
|   | $1.7^2 - 0.8^2 = 2.25$<br>and $\sqrt{2.25} = 1.5$<br><b>or</b><br>$2.89 - 0.64 = 2.25$<br>and $\sqrt{2.25} = 1.5$     | B2   | accept $1.5^2 = 2.25$ for $\sqrt{2.25} = 1.5$<br>accept $\sqrt{1.7^2 - 0.8^2} = 1.5$ for B2<br>accept $1.7^2 - 0.8^2 = 1.5^2$ for B2<br>B1 $1.7^2$ and $0.8^2$ oe |
|   | <b>Alternative method 3</b>   |      |   |
|   | $0.8^2 + 1.5^2 = 2.89$<br>and $\sqrt{2.89} = 1.7$<br><b>or</b><br>$0.64 + 2.25 = 2.89$<br>and $\sqrt{2.89} = 1.7$     | B2   | accept $1.7^2 = 2.89$ for $\sqrt{2.89} = 1.7$<br>accept $\sqrt{0.8^2 + 1.5^2} = 1.7$ for B2<br>accept $0.8^2 + 1.5^2 = 1.7^2$ for B2<br>B1 $0.8^2$ and $1.5^2$ oe |
|   | <b>Additional Guidance</b>  |      |   |
|   | B1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |      |   |
|   | $1.7^2 - 1.5^2 = 0.64$ $x^2 = 0.64$ $x = 0.8$   |      | B2  |
|   | Max B1 if any incorrect statement seen eg $1.7^2 - 1.5^2 = \sqrt{0.64} = 0.8$   |      | B1  |
|   | Accept $1.7 \times 1.7$ for $1.7^2$ etc   |      |   |
|   | Condone eg $1.5 \text{ cm}^2$ and $1.7 \text{ cm}^2$ for $1.5^2$ and $1.7^2$ for B1 but must be recovered for B2      |      |   |
|   | $0.64 \div 0.8 = 0.8$ is equivalent to $\sqrt{0.64} = 0.8$  |      |   |

| Q    | Answer  | Mark | Comments |
|------|---|------|----------|
| 7(a) | $125 \times 0.32$ or 40<br>or<br>$80 \times 0.35$ or 28   | M1   | oe       |
|      | 12  | A1   |          |
|      | <b>Additional Guidance</b>  |      |          |
|      | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |      |          |
|      | $80 \times 0.5 = 40$  |      | M0       |

| Q    | Answer  | Mark | Comments  |
|------|---|------|---|
| 7(b) | No and valid reason involving the number of trials  | B1   | eg reasons<br>she didn't do the most<br>she did fewer spins<br>Beth did more<br>they should use all 205 spins |
|      | <b>Additional Guidance</b>  |      |   |
|      | Ignore irrelevant or incorrect statements alongside a correct statement as long as not contradictory                                    |      |   |
|      | eg1 No and Beth did most but she could have done more   |      | B1  |
|      | eg2 No and Beth has more number of spins so there is a higher probability of landing on heads   |      | B1  |
|      | eg3 No and Beth did most spins but Lynn did more  |      | B0  |
|      | Allow 'she' to refer to Lynn unless clearly referring to Beth<br>eg No and Because she tried 125 times however Lynn tried only 80 times |      | B1  |
|      | No and She did not do as many spins so her answer is less accurate than Beth's  |      | B1  |
|      | No and Beth spun the wheel more times. Therefore her probability would be lower   |      | B1  |
|      | No and Beth spun more times so her final outcome will be higher   |      | B1  |
|      | No and Beth did 125 spins and Lynn did 80 spins   |      | B0  |
|      | No and Beth did 125 spins so she has more chance of being accurate  |      | B0  |

| Q | Answer  | Mark | Comments   |
|---|---|------|--|
| 8 | digits $537 \div$ digits 895<br>or<br>answer with only digit 6        | M1   | eg $537 \div 895$ or $537 \div 895000$<br>or $537 \div 0.895$<br>or<br>0.006 or 6000 |
|   | 0.6 or $\frac{3}{5}$  | A1   | oe value eg $\frac{537}{895}$  |
|   | <b>Additional Guidance</b>  |      |  |
|   | Ignore simplification or conversion attempt after correct answer seen |      |  |
|   | Condone eg $537 \div 895000^3$ for M1 but must be recovered for A1    |      |  |

| Q | Answer   | Mark | Comments  |
|---|--|------|---|
| 9 | $8.5\text{ m} \leq \text{length} < 9.5\text{ m}$ | B2   | oe<br>B1 8.5 or 9.5 in correct position<br>SC1 $9.5\text{ m} \leq \text{length} < 8.5\text{ m}$ |
|   | <b>Additional Guidance</b>                       |      |   |
|   | Accept 9.49 for 9.5                              |      |   |
|   | Accept eg 8.50 for 8.5                           |      |   |

| Q  | Answer  | Mark  | Comments  |
|----|---|-------|---|
| 10 | $1 + 0.2$ or $1.2$<br>or<br>$100(\%) + 20(\%)$ or $120(\%)$   | M1    | oe eg $x + 0.2x$<br>implied by eg $20\% = 64\,000$<br>or $10\% = 32\,000$ |
|    | $384\,000 \div 1.2$<br>or<br>$384\,000 \div 120 (\times 100)$<br>or<br>$3200 (\times 100)$                            | M1dep | oe eg $64\,000 \times 5$<br>or $32\,000 \times 10$                        |
|    | 320 000   | A1    |   |
|    | <b>Additional Guidance</b>  |       |   |
|    | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |   |
|    | 460 800 is M0 unless 1.2 oe seen  |       |   |
|    | Correct answer followed by further work   |       | M2A0  |

| Q  | Answer                             | Mark | Comments |
|----|------------------------------------|------|----------|
| 11 | $x^3y$ or $yx^3$                   | B1   |          |
|    | $5xy^3$ or $5y^3x$                 | B1   |          |
|    | $5x^2y^2$ or $5y^2x^2$             | B1   |          |
|    | <b>Additional Guidance</b>         |      |          |
|    | Mark the answer lines unless blank |      |          |
|    | Do not allow transcription errors  |      |          |



| Q  | Answer   | Mark  | Comments                                    |
|----|--|-------|---|
| 12 | <b>Alternative method 1</b>  |       |   |
|    | (guitars =) $80 \div 2$ or 40  | M1    | oe  |
|    | their $40 \div (3 + 4 + 1)$ or 5   | M1dep | oe  |
|    | $3 \times$ their 5   | M1dep | oe<br>$\frac{3}{3+4+1} \times 40$ is M3     |
|    | 15   | A1    |   |
|    | <b>Alternative method 2</b>  |       |   |
|    | $80 \div (3 + 4 + 1)$ or 10  | M1    | oe  |
|    | $3 \times$ their 10 or 30  | M1dep | oe  |
|    | their $30 \div 2$  | M1dep | oe  |
|    | 15   | A1    |   |
|    | <b>Alternative method 3</b>  |       |   |
|    | (guitars =) $80 \div 2$ or 40  | M1    | oe  |
|    | $x + \frac{4}{3}x + \frac{1}{3}x =$ their 40   | M1dep | oe equation with $x$ as number of keyboards |
|    | $\frac{14}{3}x =$ their 40   | M1dep | oe equation in form $ax = b$                |
|    | 15   | A1    |   |
|    | <b>Additional Guidance</b>   |       |   |
|    | Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts  |       |   |
|    | Other algebraic approaches are possible<br>eg (guitars =) $80 \div 2$ or 40 M1<br>$3x + 4x + x =$ their 40<br>but does not score 2nd M1 until $(x = )$ their $40 \div (3 + 4 + 1)$ |       |   |

| Q  | Answer  | Mark  | Comments   |
|----|---|-------|--|
| 13 | $\tan 38 = \frac{h}{15}$<br>or<br>$\left(\frac{15}{\cos 38}\right)^2 - 15^2$<br>or [137.3, 137.342]                         | M1    | oe eg $\tan (90 - 38) = \frac{15}{h}$<br>or $\frac{\sin 38}{h} = \frac{\sin 52}{15}$<br>any letter or phrase for $h$ eg opposite |
|    | $15 \times \tan 38$<br>or<br>$\sqrt{\left(\frac{15}{\cos 38}\right)^2 - 15^2}$<br>or [11.7, 11.72]                          | M1dep | oe eg $15 \div \tan (90 - 38)$<br>or $\frac{15 \sin 38}{\sin 52}$  |
|    | $\sin x = \frac{\text{their}[11.7, 11.72]}{14}$<br>or<br>$\sin x = [0.835, 0.84]$   | M1dep | oe<br>eg $\sin x = \frac{\sin 90}{14} \times \text{their} [11.7, 11.72]$<br>implied by $\sin^{-1} [0.835, 0.84]$                 |
|    | [56.6, 57.14012]  | A1    |  |
|    | <b>Additional Guidance</b>  |       |  |
|    | Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |  |

| Q  | Answer   | Mark | Comments  |
|----|--|------|---|
| 14 | No and valid explanation   | B1   | eg No and $0.8 \times 0.9 = 0.72$<br>or No and saves 28%<br>or No and 10% is off a smaller amount |
|    | <b>Additional Guidance</b>   |      |   |
|    | A value may be used in an explanation<br>eg $0.9 \times 0.8 \times 200 = 144$ and $0.7 \times 200 = 140$ so No |      | B1  |
|    | 2nd discount is reducing an already reduced price so No  |      | B1  |
|    | 10% off reduced price is not 10% off original price and No   |      | B1  |
|    | Cannot just add the percentages as they are of different amounts so No   |      | B1  |
|    | 10% of the already reduced price is not 10% on top of the 20% discount   |      | B1  |
|    | No and 30% is too much   |      | B0  |
|    | Incorrect overall percentage saving stated eg No and saves 22%   |      | B0  |

| Q  | Answer  | Mark | Comments  |
|----|---|------|---|
| 15 | 14  | B4   | B3 correct equation<br>eg $2x + 5x + 6 + 5x + 6 = 180$<br>or $5x + 6 = 90 - x$<br>or $2x + 90 - x + 5x + 6 = 180$<br>or $5x + 6 = 174 - 7x$<br>B2 correct expressions for two angles<br>or<br>two different correct expressions for the same angle<br>B1 correct expression for one angle |
|    | <b>Additional Guidance</b>  |      |   |
|    | Correct expressions for angles (which may be seen on the diagram) include<br>angle $AQC = 2x$<br>angle $APQ = 5x + 6$<br>angle $AQP = 5x + 6$<br>angle $APQ = \frac{180 - 2x}{2}$ or $90 - x$<br>angle $AQP = \frac{180 - 2x}{2}$ or $90 - x$<br>angle $APQ = 180 - 2x - (5x + 6)$ or $174 - 7x$<br>angle $AQP = 180 - 2x - (5x + 6)$ or $174 - 7x$<br>angle $QPB = 180 - (5x + 6)$ or $174 - 5x$<br>angle $ZPB = 5x + 6$ (Z is the end of line $QP$ produced)<br>angle $ZPA = 180 - (5x + 6)$ or $174 - 5x$ (Z is the end of line $QP$ produced) |      |   |
|    | B2 may be awarded for the same expression for two different angles<br>eg angle $APQ = 5x + 6$ and angle $AQP = 5x + 6$  |      | B2  |
|    | Accept eg $AQP$ for angle $AQP$   |      |   |
|    | Do not accept eg (angle) $P$ for angle $APQ$ unless shown on the diagram  |      |   |
|    | Ignore reasons  |      |   |

| Q  | Answer   | Mark              | Comments  |
|----|--|-------------------|---|
| 16 | $x^2 + 2x - 5x - 10$<br>or $x^2 - 3x - 10$   | M1                | oe quadratic expression<br>4 terms with at least 3 correct (terms may be seen in a grid)<br>implied by $x^2 - 3x + k$ |
|    | their $(x^2 + 2x - 5x - 10) - 6x (= 0)$<br>or their $(x^2 - 3x - 10) - 6x (= 0)$<br>or $x^2 - 9x - 10 (= 0)$   | M1dep             | accept eg $-x^2 + 9x + 10 (= 0)$<br>accept oe equations in the form $px^2 + qx = r$ eg $x^2 - 9x = 10$                |
|    | $(x + 1)(x - 10) (= 0)$<br>or $\frac{-9 \pm \sqrt{(-9)^2 - 4 \times 1 \times -10}}{2 \times 1}$<br>or $\frac{9 \pm 11}{2}$   | M1                | oe<br>ft their 3-term quadratic which cannot be $x^2 - 3x - 10$   |
|    | -1 and 10  | A1                | must have both solutions  |
|    | <b>Additional Guidance</b>   |                   |   |
|    | -1 and 10 without working  |                   | M3A1  |
|    | In the quadratic formula $9^2$ is equivalent to $(-9)^2$ but do not accept $-9^2$ unless recovered   |                   |   |
|    | $x^2 - 3x - 10 = 6x$<br>$x^2 + 3x - 10 = 0$<br>$(x + 5)(x - 2) = 0$  | M1<br>M0dep<br>M1 |   |
|    | If first M1 is awarded for 4 terms that are incorrectly simplified to 3 terms, the 2nd M1 can be awarded using the incorrect simplification<br>eg $x^2 + 2x - 5x - 10 = x^2 - 7x - 10$<br>$x^2 - 7x - 10 - 6x (= 0)$ | M1<br>M1dep       |   |

| Q  | Answer  | Mark | Comments  |
|----|---|------|---|
| 17 | (gradient $LM =$ ) 4<br>or<br>(gradient $ST =$ ) $-\frac{1}{4}$ | M1   | oe<br>do not allow inclusion of $x$ unless recovered  |
|    | Yes<br>and<br>valid reason                                      | A1   | valid reasons include<br>$-\frac{1}{4}$ is the negative reciprocal of 4<br>$-\frac{1}{4} \times 4 = -1$<br>$-1 \div (-\frac{1}{4}) = 4$ |

| Q     | Answer   | Mark | Comments  |
|-------|--|------|---|
| 18(a) | 2 11 37 82 100   | B1   | may be implied by plots   |
|       | Correct cf diagram with points joined with a smooth curve or lines                     | B2ft | $\pm \frac{1}{2}$ small square<br>ft their cf values which must be increasing for B2 or B1<br>B1ft cf diagram with all points plotted at their heights but not at correct horizontal positions<br>or<br>cf diagram with all points plotted at correct horizontal positions with at least 4 of their heights correct<br>or<br>all points plotted correctly at their heights but cf diagram not drawn or drawn poorly |
|       | <b>Additional Guidance</b>   |      |   |
|       | Ignore diagram to the left of their (40, 2)  |      |   |
|       | For B2ft the diagram must end at (200, their 100) unless followed by a horizontal line |      |   |
|       | Histogram only   |      | Max B1B0  |
|       | Histogram and cf diagram   |      | Mark the cf diagram   |

| Q     | Answer  | Mark | Comments  |
|-------|---|------|---|
| 18(b) | Correct median for their cumulative frequency diagram   | B1ft | ft their diagram which must be increasing<br>$\pm \frac{1}{2}$ small square                           |
|       | Correct comparison of their type P median with 126  | B1ft | answers must be in context<br>eg P lasts longer<br>or P is better                                     |
|       | Correct interquartile range for their cumulative frequency diagram  | B1ft | ft their diagram which must be increasing<br>$\pm \frac{1}{2}$ small square                           |
|       | Correct comparison of their type P interquartile range with 57  | B1ft | answers must be in context<br>eg P is more consistent<br>or P is more reliable<br>or Q is more varied |
|       | <b>Additional Guidance</b>  |      |   |
|       | 2nd and 4th marks - ignore irrelevant or incorrect statements alongside a correct statement as long as not contradictory<br>eg (P median = 132) P lasts longer by 8 (error) minutes |      | 2nd B1  |
|       | P's average is bigger   |      | 2nd B0  |
|       | P's median is greater   |      | 2nd B0  |
|       | P's spread is smaller   |      | 4th B0  |
|       | P's IQR is lower  |      | 4th B0  |
|       | Q is more spread out  |      | 4th B0  |
|       | 2nd and 4th marks can be awarded even if their diagram is not increasing  |      |   |
|       | 2nd and 4th marks can be awarded even if the methods used for P's median and IQR are incorrect  |      |   |



| Q  | Answer  | Mark  | Comments   |
|----|---|-------|--|
| 19 | <b>Alternative method 1 : starts by working out area of phone screen</b>  |       |  |
|    | $15 \div 6$ or 2.5<br>or<br>$6 \div 15$ or 0.4<br>or<br>$420 \div 15$ or 28   | M1    | oe   |
|    | $420 \div (15 \div 6)^2$<br>or<br>$420 \times (6 \div 15)^2$<br>or<br>$420 \div 15 \times (6 \div 15) \times 6$<br>or<br>67.2 | M1dep | oe   |
|    | their $67.2 \times \frac{7000}{100^2}$  | M2dep | oe<br>M1dep their $67.2 \div 100^2$ or 0.00672<br>or<br>their $67.2 \times 7000$ or 470400<br>M1 $\frac{7000}{100^2}$ or 0.7 |
|    | 47(.04)   | A1    | SC3 digits 4704  |

**Mark scheme and Additional Guidance continue on the next page**

|                     |   |       |  |
|---------------------|---|-------|--|
| <b>Q19<br/>cont</b> | <b>Alternative method 2 : starts by working out cost of tablet screen</b>   |       |  |
|                     | $420 \times \frac{7000}{100^2}$ or 294  | M2    | oe<br>M1 $420 \div 100^2$ or 0.042<br>or $420 \times 7000$ or 2940 000<br>or $\frac{7000}{100^2}$ or 0.7 |
|                     | $15 \div 6$ or 2.5<br>or<br>$6 \div 15$ or 0.4  | M1    | oe   |
|                     | their $294 \div (15 \div 6)^2$<br>or<br>their $294 \times (6 \div 15)^2$  | M1dep | oe<br>dep on M3  |
|                     | 47(.04)   | A1    | SC3 digits 4704  |
|                     | <b>Additional Guidance</b>  |       |  |
|                     | Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |  |

| Q  | Answer  | Mark | Comments   |
|----|---|------|--|
| 20 | $8 = \frac{24}{u_1} + 4$  | M1   | oe eg $4 = \frac{24}{u_1}$<br>accept $u_1$ replaced by a different variable<br>eg $x$  |
|    | $u_1 = 6$   | A1   | do not accept $x = 6$ in working with<br>nothing on answer line for $u_1$  |
|    | $u_3 = 7$   | B1   | SC1 $u_1 = 7$ and<br>$u_3 = 7\frac{3}{7}$ or $\frac{52}{7}$ or [7.4, 7.43]<br><b>or</b><br>$u_1 = 7$ and<br>$u_3 = 7\frac{3}{13}$ or $\frac{94}{13}$ or [7.2, 7.231] |
|    | <b>Additional Guidance</b>  |      |  |
|    | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |      |  |
|    | Embedded $u_1$ eg $8 = \frac{24}{6} + 4$  |      | M1   |

| Q     | Answer  | Mark | Comments                      |
|-------|---|------|-------------------------------|
| 21(a) | Draws a tangent at 2 seconds<br>and<br>[1.5, 2.5] | B2   | B1 draws tangent at 2 seconds |

| Q     | Answer   | Mark | Comments  |  |
|-------|--|------|---|--|
| 21(b) | [88, 95]                                       | B3   | B2 (area under curve $\Rightarrow$ ) [16, 22]<br><b>or</b><br>(area under horizontal $\Rightarrow$ ) 48<br>and (area under diagonal $\Rightarrow$ ) 24<br>implied by 72<br>B1 (area under horizontal $\Rightarrow$ ) 48<br>or (area under diagonal $\Rightarrow$ ) 24 |  |
|       | Additional Guidance                            |      |   |  |
|       | For B2 and B1 areas may be seen on the diagram |      |   |  |

| Q     | Answer  | Mark | Comments             |
|-------|---|------|----------------------|
| 21(c) | Underestimate<br>and<br>valid reason involving area under the graph | B1ft | ft their area in (b) |

| Q  | Answer  | Mark  | Comments   |
|----|---|-------|--|
| 22 | $(n - 15)^2$  | M1    |  |
|    | $(n - 15)^2 - 15^2 + 236$<br>or $(n - 15)^2 - 225 + 236$<br>or $(n - 15)^2 + 11$                | M1dep | may be embedded in or implied by an inequality or equation<br>eg $(n - 15)^2 - 15^2 + 236 = 10$<br>$(n - 15)^2 - 15^2 + 236 > 10$<br>$(n - 15)^2 > -1$ |
|    | Valid explanation with M1 seen  | A1    | eg M1 seen and all the terms must be 11 or more<br>or<br>$(n - 15)^2 \geq 0$ and 11 is added   |
|    | <b>Additional Guidance</b>  |       |  |
|    | Condone a different letter used eg $x$  |       |  |
|    | M2 and all the terms must be greater than 11  |       | M2A0   |
|    | M2 and the 15th term is the smallest  |       | M2A0   |
|    | Least term is 11 with no working for completing the square                                      |       | M0   |
|    | M2 and squaring a bracket always has two digits then adding 11 means it has at least two digits |       | M2A0   |
|    | $(n - 15)(n - 15)$ is equivalent to $(n - 15)^2$  |       |  |
|    | $(n - 15n)^2$   |       | M0   |
|    | Ignore incorrect work after M2 eg $(n - 15)^2 + 11 = 0$   |       | M2   |
|    | Condone $(n - 15)^2$ is positive and 11 is added  |       | M2A1   |

| Q     | Answer   | Mark | Comments               |
|-------|--|------|------------------------|
| 23(a) | <b>Alternative method 1</b>  |      |                        |
|       | angle $ACB = 53$   | M1   | may be seen on diagram |
|       | 106  | A1   |                        |
|       | <b>Alternative method 2</b>  |      |                        |
|       | angle $OAB = 90 - 53$ or 37<br>or<br>angle $OBA = 90 - 53$ or 37         | M1   | may be seen on diagram |
|       | 106  | A1   |                        |
|       | <b>Additional Guidance</b>   |      |                        |
|       | Accept eg $ACB$ for angle $ACB$  |      |                        |
|       | Accept (angle) $C$ for angle $ACB$                                       |      |                        |
|       | Do not accept eg (angle) $A$ for angle $OAB$ unless shown on the diagram |      |                        |
|       | Ignore reasons   |      |                        |

| Q     | Answer  | Mark  | Comments  |
|-------|---|-------|---|
| 23(b) | $g = 180 - 63$ or 117   | M1    | may be seen on diagram  |
|       | $f = \text{their } 117 \div 3 \times 2$ or 78   | M1dep | oe<br>may be seen on diagram                                      |
|       | $h = 180 - \text{their } 78$ or 102   | M1dep | may be seen on diagram<br>equivalent ratios to 13 : 17 implies M3 |
|       | 13 : 17   | A1    | accept $1 : \frac{17}{13}$ or $\frac{13}{17} : 1$                 |
|       | <b>Additional Guidance</b>  |       |   |
|       | Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |   |
|       | Ignore reasons  |       |   |

| Q  | Answer   | Mark | Comments  |
|----|--|------|---|
| 24 | Response showing that $GD$ bisects angle $ADF$<br>and<br>all reasons | B4   | B3 response showing that $GD$ bisects angle $ADF$<br><br>B2 correct expressions for two angles in terms of $x$ (angles must be above $AD$ )<br>or<br>two correct statements about a pair of angles (angles must be above $AD$ )<br><br>B1 correct expression for one angle in terms of $x$ (angle must be above $AD$ )<br>or<br>one correct statement about a pair of angles (angles must be above $AD$ ) |

**Additional Guidance is on the next page**

| 24<br>cont | Additional Guidance   |  |
|------------|---|--|
|            | <p>Correct expressions for angles (which may be seen on the diagram) include</p> <p>angle <math>DAG = x</math></p> <p>angle <math>ADF = 180 - x</math></p> <p>angle <math>ADG = \frac{180 - x}{2}</math> or <math>90 - \frac{x}{2}</math></p> <p>angle <math>AGD = \frac{180 - x}{2}</math> or <math>90 - \frac{x}{2}</math></p> <p>angle <math>GDF = 180 - x - \frac{180 - x}{2}</math> or <math>\frac{180 - x}{2}</math> or <math>90 - \frac{x}{2}</math></p> <p>angle <math>DGF = \frac{x}{2}</math></p> |  |
|            | Expressions must be explicit eg do not accept angle $ADF + x = 180$ unless recovered  |  |
|            | <p>Correct statements about a pair of angles include</p> <p>angle <math>AGD = \text{angle } GDF</math></p> <p>angle <math>AGD = \text{angle } ADG</math></p> <p>angle <math>ADG = \text{angle } GDF</math></p> <p>angle <math>AGD = 90 - \text{angle } DGF</math></p> <p>angle <math>GDF = 90 - \text{angle } DGF</math></p>  |  |
|            | Accept eg angle $AGD$ and angle $ADG$ both labelled $y$ as a correct statement about a pair of angles   |  |
|            | Accept eg $DAG$ for angle $DAG$   |  |
|            | Do not accept a single upper case letter for an angle unless shown on the diagram   |  |
|            | For up to B2 allow assumption that $GD$ bisects angle $ADF$   |  |
|            | <p>Reasons needed will depend on the approach used and will include some of</p> <p>alternate angles (are equal)</p> <p>(base) angles of isosceles triangle (are equal)</p> <p>angles in rectangle are 90</p> <p>angles of triangle (add up to 180)</p> <p>(adjacent) angles on a (straight) line (add to 180)</p>   |  |