



THIRD SPACE  
LEARNING

# Mathematics

## Paper 6

### (Calculator)

### Higher Tier

### Mark Scheme

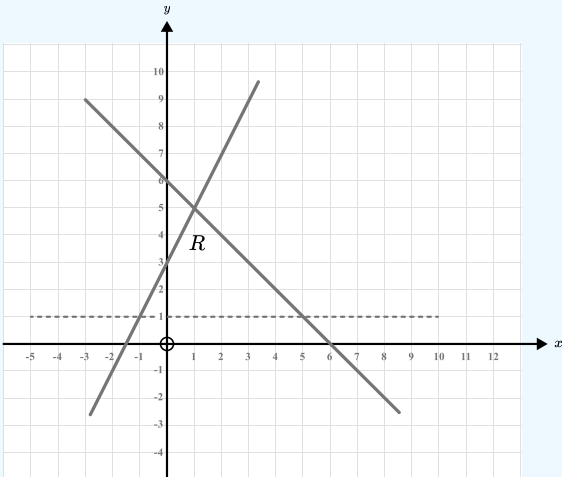
OCR GCSE

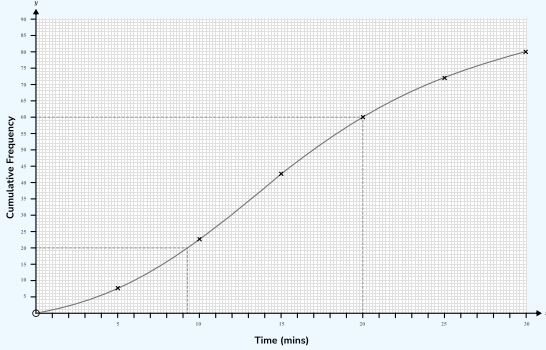
SET 1A

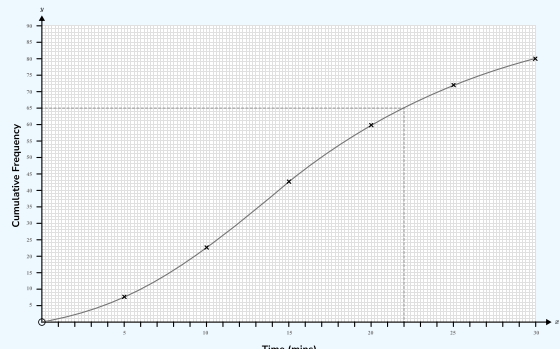
| Question     | Working   | Answer                              | Notes   |
|--------------|---|-------------------------------------|---|
| <b>Q1</b>    | 3 parts=27 employees<br>$27 \div 3 = 9$<br>$5 + 8 = 13$<br>$9 \times 13 = 117$  | 117                                 | M1 $27 \div 3 = 9$<br>A1 cao  |
| <b>Q2a</b>   | $30 \div 12 = 2.5$<br>$120 \times 2.5 = 300\text{g butter}$<br>$150 \times 2.5 = 375\text{g sugar}$<br>$2 \times 2.5 = 5\text{ eggs}$<br>$160 \times 2.5 = 400\text{g flour}$ | No she does not have enough flour   | M1 2. 5 seen<br>M1 At least 2 quantities correctly calculated<br>A1 No with a correct explanation                                     |
| <b>Q2bi</b>  |   | 120:150                             | A1 cao  |
| <b>Q2bii</b> |   | 1:1.25                              | M1 Any correct simplification of the ratio<br>A1 cao  |
| <b>Q3a</b>   | Ollie: $x$ , Tommy: $x + 12$ , Amber: $2x + 24$<br>$x + x + 12 + 2x + 24 = 136$<br>$4x + 36 = 136$  | $4x + 36 = 136$                     | M1 Attempt to add expressions for all 3 students and put equal to 136<br>A1 oe  |
| <b>Q3b</b>   | $x = 25$  | Ollie: 25<br>Tommy: 37<br>Amber: 74 | M1 $x = 25$<br>A1 All 3 correct   |
| <b>Q4</b>    | Area of circle: $\pi \times 8^2 = 201.0619298\dots$<br>Area of one triangle: $\frac{1}{2} \times 8 \times 8 = 32$<br>$201.0619298 - 2 \times 32 = 137.0619298\dots$           | $137\text{cm}^2$                    | M1 Correct area of circle or Correct area for one triangle<br>M1 $201.0619298 - 2 \times 32$<br>A1 Correct to 3sf<br>B1 Correct units |

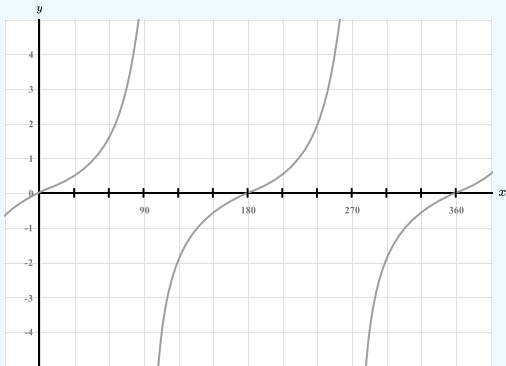
| Question | Working   | Answer                        | Notes  |    |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
|----------|---|-------------------------------|--|----|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|---|---|---|---|----|----|----|---|---|---|----|----|----|----|---|---|----|----|----|----|----|---|---|----|----|----|----|----|--|--|
| Q5       |   | E.g. 5=6-1<br>7=6+1<br>11=6-1 | M1 Any one correct example clearly stated<br>M1 Any two correct examples clearly stated<br>M1 Any three correct examples clearly stated        |    |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| Q6a      | <table><tr><td>×</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>1</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>2</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td></tr><tr><td>3</td><td>3</td><td>6</td><td>9</td><td>12</td><td>15</td><td>18</td></tr><tr><td>4</td><td>4</td><td>8</td><td>12</td><td>16</td><td>20</td><td>24</td></tr><tr><td>5</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td></tr><tr><td>6</td><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td></tr></table> | ×                             | 1  | 2  | 3  | 4  | 5 | 6 | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 2 | 2 | 4 | 6 | 8 | 10 | 12 | 3 | 3 | 6 | 9 | 12 | 15 | 18 | 4 | 4 | 8 | 12 | 16 | 20 | 24 | 5 | 5 | 10 | 15 | 20 | 25 | 30 | 6 | 6 | 12 | 18 | 24 | 30 | 36 |  | M1 At least three rows correct<br>A1 cao |
| ×        | 1   | 2                             | 3  | 4  | 5  | 6  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| 1        | 1   | 2                             | 3  | 4  | 5  | 6  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| 2        | 2   | 4                             | 6  | 8  | 10 | 12 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| 3        | 3   | 6                             | 9  | 12 | 15 | 18 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| 4        | 4   | 8                             | 12   | 16 | 20 | 24 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| 5        | 5   | 10                            | 15   | 20 | 25 | 30 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| 6        | 6   | 12                            | 18   | 24 | 30 | 36 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| Q6b      | $50p \times 180 = \text{£}90$<br>$P(\text{Score } 20/24/25/30): \frac{7}{36}$<br>$\frac{7}{36} \times 180 = 35$<br>$35 \times \text{£}1 = \text{£}35$<br>$P(\text{Score } 36): \frac{1}{36}$<br>$\frac{1}{36} \times 180 = 5$<br>$5 \times \text{£}3 = \text{£}15$<br>$\text{£}35 + \text{£}15 = \text{£}50 \text{ won}$<br>Profit: $\text{£}90 - \text{£}50 = \text{£}40$  | £40                           | M1: $50p \times 180 = \text{£}90$<br>M1: $\frac{7}{36}$ and $\frac{1}{36}$ seen or implied<br>M1: 35 people win £1, 5 people win £3<br>A1: cao |    |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| Q7a      | Area of triangle: $\frac{1}{2} \times 4 \times 1.8 = 3.6$<br>Volume: $13.6 \times 12 = 43.2\text{cm}^3$   |                               | M1 Attempting to calculate area of triangle<br>M1 Multiplying their area by 12<br>A1 All steps correct   |    |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |
| Q7b      | Density: $\frac{34.56}{43.2} = 0.8\text{g/cm}^3$  | 0.8g/cm³                      | M1 $\frac{34.56}{43.2}$<br>A1 cao  |    |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |    |   |   |   |   |    |    |    |   |   |   |    |    |    |    |   |   |    |    |    |    |    |   |   |    |    |    |    |    |  |  |

| Question             | Working   | Answer             | Notes   |                      |     |                   |     |               |     |                    |     |  |   |
|----------------------|---|--------------------|---|----------------------|-----|-------------------|-----|---------------|-----|--------------------|-----|--|---|
| Q8                   | c=kh<br>320 = k×4<br>k=80<br>c= 80×7 = £560   | Yes                | M1 dividing 320 by 4<br>M1 80×7 = £560<br>A1 Yes  |                      |     |                   |     |               |     |                    |     |  |   |
| Q9                   | Angle BCA=Angle CAD since alternate angles are equal<br>Angle CBD=Angle BDA since alternate angle are equal<br>BC=AD since opposite sides of a parallelogram are equal  | Congruent by ASA   | M1 Identifying a pair of equal angles and a pair of equal sides<br>M1 Correctly identifying enough equivalences to prove congruence<br>A1 Congruent and reason stated |                      |     |                   |     |               |     |                    |     |  |   |
| Q10                  | <table><tr><td></td><td>Graph</td></tr><tr><td><math>y = x^3 + 4x^2 - 8</math></td><td><math>B</math></td></tr><tr><td><math>y = \frac{2}{x}</math></td><td><math>A</math></td></tr><tr><td><math>y = 2^x - 8</math></td><td><math>D</math></td></tr><tr><td><math>y = x^2 + 2x - 8</math></td><td><math>C</math></td></tr></table> |                    | Graph   | $y = x^3 + 4x^2 - 8$ | $B$ | $y = \frac{2}{x}$ | $A$ | $y = 2^x - 8$ | $D$ | $y = x^2 + 2x - 8$ | $C$ |  | B1 One correct<br>B1 Two correct<br>B1 Three correct<br>B1 Four correct |
|                      | Graph   |                    |   |                      |     |                   |     |               |     |                    |     |  |   |
| $y = x^3 + 4x^2 - 8$ | $B$   |                    |   |                      |     |                   |     |               |     |                    |     |  |   |
| $y = \frac{2}{x}$    | $A$   |                    |   |                      |     |                   |     |               |     |                    |     |  |   |
| $y = 2^x - 8$        | $D$   |                    |   |                      |     |                   |     |               |     |                    |     |  |   |
| $y = x^2 + 2x - 8$   | $C$   |                    |   |                      |     |                   |     |               |     |                    |     |  |   |
| Q11a                 |   | 11, 12, 13, 14, 15 | M1 At least 4 correct values<br>A1 cao  |                      |     |                   |     |               |     |                    |     |  |   |
|                      |   |                    |   |                      |     |                   |     |               |     |                    |     |  |   |

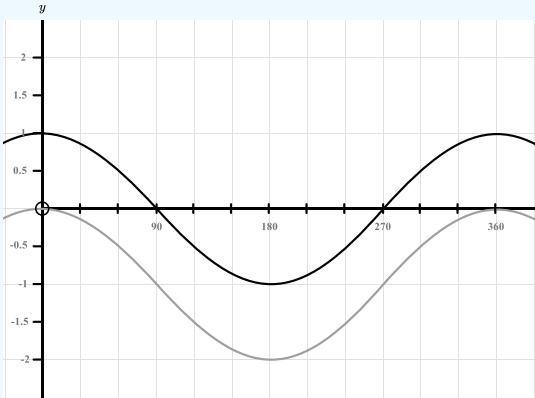
| Question    | Working  | Answer                      | Notes  |
|-------------|--|-----------------------------|--|
| <b>Q11b</b> |   |                             | M1 One line correctly plotted<br>M1 Two lines correctly plotted<br>M1 All three lines correctly plotted<br>A1 Correct region indicated |
| <b>Q12</b>  | $2.2 \times 10^{-8} \times 1.2 \times 10^{-8} = 2.64 \times 10^{-16}$<br>$2.2 \times 10^{-8} \times 8 \times 10^{-9} = 1.76 \times 10^{-16}$<br>$8 \times 10^{-9} \times 1.2 \times 10^{-8} = 9.6 \times 10^{-17}$<br>$(2 \times 2.64 \times 10^{-16}) + (2 \times 1.76 \times 10^{-16}) + (2 \times 9.6 \times 10^{-17}) = 1.072 \times 10^{-15}$ | $1.072 \times 10^{-15}$     | M1 Correctly working out the area of one face<br>M1 Correctly working out the area of all three faces<br>A1 cao                        |
| <b>Q13</b>  | $\text{£}1 = 125\%$<br>$\text{£}1 \div 125 = 0.008, 0.008 \times 100 = 80p$<br>$80p \times 1.3 = \text{£}1.04$   | 4p                          | M1 $\text{£}1 = 125\%$ seen<br>M1 Correctly calculating cost price = 80p<br>M1 Adding 30% to their cost price<br>A1 cao                |
| <b>Q14a</b> |  | The initial number of trees | B1 cao   |
| <b>Q14b</b> |  | 10%                         | B1 cao   |
|             |  |                             |  |

| Question    | Working   | Answer               | Notes  |
|-------------|---|----------------------|--|
| <b>Q14c</b> | 1 year: 22500<br>2 years: 20250<br>3 years: 18225<br>4 years: 16402.5<br>5 years: 14762.25<br>6 years: 13286.025<br>7 years: 11957.4225 | 7 years              | M1 Correctly calculating number of trees for 2 years including 7 years<br>A1 cao |
| <b>Q15</b>  | $\frac{12a^8b^3}{3a^2b^{-3}} = 4a^6b^6$   | $4a^6b^6$            | M1 $12a^8b^3$ seen<br>A1 cao   |
| <b>Q16a</b> |   | 8, 22, 43, 60, 71 80 | B1 cao   |
| <b>Q16b</b> |   |                      | M1 Points plotted correctly ft from their part a<br>A1 Fully correct graph drawn |
| <b>Q16c</b> | <br>20-9.4=10.6                                       | 10.6 minutes         | M1 horizontal lines drawn at 20 or 60<br>A1 cao                                  |

| Question   | Working                                      | Answer   | Notes   |
|--|--|--|---|
| <div>Q16d</div> <div></div> <div>80-65=15<br/><math>\frac{15}{80}=18.75\%</math><br/>10% of 80=8</div>                                      |  | <div>No there are 15 children who travel more than 22 minutes and 10% of children is 8</div>   | <div>M1 vertical line drawn at 22 minutes<br/>M1 10% is 8<br/>A1 No and 15-17 and 8</div> |
| <div>Q17a</div> <div><math>(5x^2+18x-8)(2x+3)</math><br/><math>10x^3+15x^2+36x^2+54x-16x-24</math><br/><math>10x^3+51x^2+38x-24</math></div>   | <div><math>10x^3+51x^2+38x-24</math></div>   | <div>M1 Correctly expanding 2 brackets<br/>M1 Correctly multiplying by third bracket<br/>A1 Fully simplified answer</div>  |   |
| <div>Q17b</div>  | <div><math>(2x+5y)(2x-5y)</math></div>       | <div>M1 Two terms that multiply to <math>4x^2</math> or <math>-25y^2</math><br/>A1 cao</div>   |   |
| <div>Q17c</div> <div><math>m = \frac{2p+7}{p-t}</math><br/><math>m(p-t) = 2p+7</math><br/><math>mp-mt = 2p+7</math><br/><math>mp-2p = 7+mt</math><br/><math>p(m-2) = 7+mt</math><br/><math>p = \frac{7+mt}{m-2}</math></div> | <div><math>p = \frac{7+mt}{m-2}</math></div> | <div>M1 Multiplying by 'p-t' and expanding brackets<br/>M1 Rearranging so that 'p' terms are on one side and other terms on the other side<br/>M1 Factorising p<br/>A1 cao</div> |   |

| Question    | Working   | Answer              | Notes  |
|-------------|---|---------------------|--|
| <b>Q18</b>  | $\cos(57) = \frac{7}{MP}$<br>$MP = \frac{7}{\cos(57)} = 12.852549...$<br>$\frac{\sin(x)}{11} = \frac{\sin(74)}{12.852549...}$<br>$\sin(x) = 0.8227067...$<br>$x = 55.4^\circ$ | $55.4^\circ$        | M1 Use of $\cos(x) = \frac{A}{H}$ to find the length MP<br>A1 MP=12.852549...<br>M1 Use of sine rule with values correctly substituted in<br>A1 cao                        |
| <b>Q19a</b> | $x^2 + 4x - 5 = (x + 2)^2 - 4 - 5$<br>$= (x + 2)^2 - 9$   | $a = 2$<br>$b = -9$ | M1 $(x + 2)^2 + a$<br>A1 cao   |
| <b>Q19b</b> |   | $(-2, -9)$          | B1 cao   |
| <b>Q19c</b> | $(x + 2)^2 - 9 = 0$<br>$(x + 2)^2 = 9$<br>$x + 2 = \pm\sqrt{9}$<br>$x + 2 = \pm 3$<br>$x = 3 - 2 = 1$<br>or $x = -3 - 2 = -5$   |                     | M1 Setting their $(x + 2)^2 - 9$ equal to 0 (ft part a)<br>M1 Adding their 9 and square rooting. Must show + and - square root<br>A1 Subtracting 2. Fully correct working. |
| <b>Q20a</b> |    |                     | B1 cao   |



| Question | Working  | Answer           | Notes  |
|----------|--|------------------|--|
| Q20b     |   |                  | B1 cao   |
| Q20c     |  | (180, 1)         | B1 x or y coordinate correct<br>B1 cao   |
| Q21      | Area scale factor: $297 \div 132 = 2.25$<br>Length scale factor: $\sqrt{2.25} = 1.5$<br>Volume scale factor: $2.25^3$<br>$80 \times 2.25^3 = 270\text{cm}^3$ | $270\text{cm}^3$ | M1 $297 \div 132 = 2.25$<br>M1 Square rooting 2.25 to find length scale factor<br>M1 Cubing to find volume scale factor<br>M1 $80 \times 2.25^3$<br>A1 Correct answer with units |
|          |  |                  |  |

| Question   | Working   | Answer                    | Notes  |
|------------|---|---------------------------|--|
| <b>Q22</b> | After green ball removed $P(\text{Green}) = \frac{2}{n-1}$<br>$\frac{3}{n} - 0.1 = \frac{2}{n-1}$<br>$\frac{30}{n} - 1 = \frac{20}{n-1}$<br>$30(n-1) - n(n-1) = 20n$<br>$30n - 30 - n^2 + n = 20n$<br>$n^2 - 11n + 30 = 0$<br>$(n-5)(n-6) = 0$<br>$n = 5 \text{ or } n = 6$ | $n = 5 \text{ or } n = 6$ | M1 After green ball removed $P(\text{Green}) = \frac{2}{n-1}$<br>M1 $\frac{3}{n} - 0.1 = \frac{2}{n-1}$<br>M1 Multiplying by n and n-1 to get a quadratic<br>M1 $n^2 - 11n + 30 = 0$<br>A1 cao |

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