



- b) Population of Deepland =  $27 \times 4.2 \times 10^5$

$$\begin{array}{r} \text{First find } 27 \times 42: \\ 27 \\ \times 42 \\ \hline 54 \\ 1080 \\ \hline 1134 \end{array}$$

So,  $27 \times 4.2 = 113.4$  [1 mark]

So population of Deepland =  $113.4 \times 10^5$   
 $= 1.1 \times 10^7$  (2 s.f.) [1 mark]

[2 marks available in total — as above]

- 12 Shape A: Area =  $\pi \times 4^2 = 16\pi$

$$\text{Shape B: Area} = \frac{80}{360} \times \pi \times 6^2 = 8\pi$$

$16\pi = 2 \times 8\pi$  so the area of A is twice the area of B.

[3 marks available — 1 mark for the area of shape A, 1 mark for the correct method to find the area of shape B, 1 mark for the area of shape B and showing that the area of shape A is twice the area of shape B]

- 13 Negative powers correspond to reciprocals and fractional powers correspond to roots.

$$\left(2\frac{1}{4}\right)^{\frac{1}{2}} = \left(\frac{9}{4}\right)^{\frac{1}{2}} = \left(\frac{3}{2}\right)^{\frac{1}{2}} \quad [1 \text{ mark}] = \sqrt{\frac{4}{9}} = \frac{2}{3} \quad [1 \text{ mark}]$$

$$\left(2\frac{1}{4}\right)^{\frac{1}{2}} \div \frac{2}{9} = \frac{2}{3} \div \frac{2}{9} = \frac{2}{3} \times \frac{9}{2} = 3 \quad [1 \text{ mark}] = 3 \quad [1 \text{ mark}]$$

[4 marks available in total — as above]

- 14 a) The cumulative frequency diagram starts at 40 minutes so that is the quickest possible winning time in 2014.

Difference:  $40 - 37 = 3$  minutes

[2 marks available — 1 mark for finding the quickest possible winning time in 2014, 1 mark for the correct answer]

- b) To find the median, read across at 30 and then read down:

Median for 2014 = 71.5 minutes. [1 mark]

The teams were faster on average in 2014 than in 2013 as the median was lower. [1 mark]

[2 marks available in total — as above]

- c) To find the upper quartile read across and down at 45, to find the lower quartile read across and down at 15:

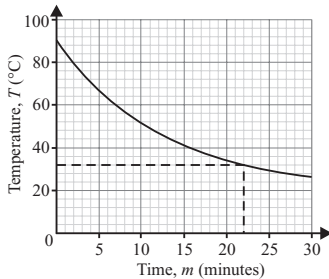
Upper quartile = 78 and lower quartile = 63

Interquartile range =  $78 - 63 = 15$  minutes [1 mark]

The times of the teams were less spread out in 2014 than in 2013 as the interquartile range was smaller, so times were more consistent in 2014. [1 mark]

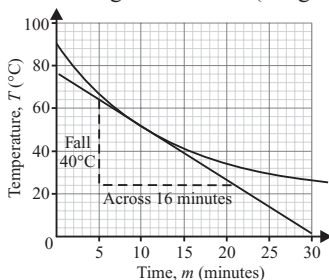
[2 marks available in total — as above]

- 15 a) Read across and down at 32 °C.



To reach 32 °C it takes 22 minutes [1 mark]

- b) Draw a tangent at  $m = 10$  (see graph) [1 mark]



Gradient of tangent =  $-40 \div 16$  [1 mark]

$$= -2.5 \text{ °C/minute}$$

So 10 minutes after the tea is made it is decreasing at a rate of 2.5 °C/minute. [1 mark for an answer in the range 2.3-2.7]

[3 marks available in total — as above]

- 16 Rationalise the denominator of the first term:

$$\frac{6}{\sqrt{3}} = \frac{6\sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3} \quad [1 \text{ mark}]$$

And simplify the second term:

$$\sqrt{27} = \sqrt{9 \times 3} = 3\sqrt{3} \quad [1 \text{ mark}]$$

$$\text{So } \frac{6}{\sqrt{3}} + \sqrt{27} = 2\sqrt{3} + 3\sqrt{3} = 5\sqrt{3} \quad [1 \text{ mark}]$$

[3 marks available in total — as above]

- 17 Angle  $DBA = 35^\circ$  [1 mark] (alternate segment theorem)

Angle  $OAD = 90^\circ - 35^\circ = 55^\circ$  [1 mark]

(a tangent and a radius are perpendicular)

Obtuse angle  $COA = 2 \times$  angle  $CBA$

$$= 2(39^\circ + 35^\circ) = 2 \times 74^\circ = 148^\circ \quad [1 \text{ mark}]$$

(angle at centre is twice angle at circumference)

Angle  $CDA = 180^\circ - 74^\circ = 106^\circ$  [1 mark]

(opposite angles in a cyclic quadrilateral add up to 180°)

Angle  $DCO = 360^\circ - 106^\circ - 148^\circ - 55^\circ = 51^\circ$  [1 mark]

(angles in a quadrilateral add up to 360°)

[5 marks available in total — as above]

There may be alternative ways of getting to the same answer.

- 18 a)  $x = \frac{18(s+2t^2)}{5t}$

$$5xt = 18(s+2t^2)$$

$$5xt = 18s + 36t^2 \quad [1 \text{ mark}]$$

$$18s = 5xt - 36t^2$$

$$s = \frac{5xt - 36t^2}{18} \quad [1 \text{ mark}] \text{ or } s = \frac{5xt}{18} - 2t^2$$

[2 marks available in total — as above]

- b)  $s = kt^2$  [1 mark]

$$s = 160 \text{ and } t = 8 \text{ so } 160 = k \times 8^2$$

$$\text{So } k = 160 \div 64 = 2.5 \quad [1 \text{ mark}]$$

$$\text{When } t = 6, s = 2.5 \times 6^2 = 90 \text{ m} \quad [1 \text{ mark}]$$

Therefore from part a):

$$90 = \frac{5x \times 6}{18} - 2 \times 6^2 \quad [1 \text{ mark}]$$

$$90 + 72 = \frac{5x}{3}$$

$$x = \frac{162 \times 3}{5} = \frac{486}{5} = 97.2 \quad [1 \text{ mark}]$$

[5 marks available in total — as above]

- 19 a)  $(n+1)(n-1)(n+4) = (n^2 - n + n - 1)(n+4)$  [1 mark]

$$= (n^2 - 1)(n+4) \quad [1 \text{ mark}]$$

$$= n^3 + 4n^2 - n - 4 \quad [1 \text{ mark}]$$

[3 marks available in total — as above]

- b)  $n(n+3)(n+1) = n(n^2 + n + 3n + 3)$

$$= n(n^2 + 4n + 3)$$

$$= n^3 + 4n^2 + 3n \quad [1 \text{ mark}]$$

$$\text{So } n(n+3)(n+1) - (n+1)(n-1)(n+4)$$

$$= n^3 + 4n^2 + 3n - (n^3 + 4n^2 - n - 4)$$

$$= 4n + 4 = 4(n+1) \quad [1 \text{ mark}]$$

$n$  is an integer so  $4(n+1)$  must be a multiple of 4. [1 mark]

[3 marks available in total — as above]

An alternative method would be to notice that  $(n+1)$  appears as a factor of both parts and so can be taken out as a factor of the whole expression, i.e.  $(n+1)[n(n+3) - (n-1)(n+4)]$ .

The expression inside the square brackets can then be shown to simplify to give 4.

- 20 The turning point of a graph written in the form  $y = (x-a)^2 + b$  is at the point  $(a, b)$ . The turning point is at  $(2, 7)$  so the curve must have the equation  $y = (x-2)^2 + 7$  [1 mark]

Substituting  $y = 128$  and  $x = k$  gives  $128 = (k-2)^2 + 7$  [1 mark]

$$121 = (k-2)^2$$

$$\pm\sqrt{121} = k-2 \quad [1 \text{ mark}]$$

$$\pm 11 = k-2$$

$$\text{So } k = 13 \text{ or } k = -9 \quad [1 \text{ mark}]$$

[4 marks available in total — as above]

The equation could be solved by factorising or using the quadratic formula, but using the completed square form is simplest here.

# Working Out Your Grade

- Do a complete exam (i.e. all three papers).
- Use the answers and mark scheme to mark each exam paper.
- Use the tables below to record your marks.

## Paper 1

Q	Mark	Q	Mark
1		12	
2		13	
3		14	
4		15	
5		16	
6		17	
7		18	
8		19	
9		20	
10			
11			
<b>Total</b>		<b>/80</b>	

## Paper 2

Q	Mark	Q	Mark
1		12	
2		13	
3		14	
4		15	
5		16	
6		17	
7		18	
8		19	
9		20	
10		21	
11			
<b>Total</b>		<b>/80</b>	

## Paper 3

Q	Mark	Q	Mark
1		12	
2		13	
3		14	
4		15	
5		16	
6		17	
7		18	
8		19	
9		20	
10		21	
11		22	
<b>Total</b>		<b>/80</b>	

- Add together your marks for the three papers to give a total mark out of 240.

Total Mark = Paper 1 Total + Paper 2 Total + Paper 3 Total

Total Mark =  / 240

Overall Percentage =  % *(one last bit of maths for you to do)*

- Look up your overall percentage in this table to see what grade you got.

Overall Percentage	Grade
93	<b>9</b>
81	<b>8</b>
68	<b>7</b>
56	<b>6</b>
43	<b>5</b>
31	<b>4</b>

### ***Important!***

The grade boundaries above are given as a guide only.

Exam boards tinker with their boundaries each year, so any grade you get on these practice papers is no guarantee of getting that grade in the real exam — but it should give you a pretty good idea.