1.	19/100			A1	1 mark
2.	(a)	x^{10}		A1	
	(b)	$2x^4$		A1	
	(c)	x^{15}		A1	3 marks
3.	(a)	rotation of 180°	(clockwise or anti-clockwise)	A1	
		about (½, 2)		A1	
	(b)	translation of 4 units		A1	
		in the x direction		A1	
	(c)	reflection in the line $x = ½$		A1	5 marks
4.	(a)	right angled triangle		A1	
		angle at circumference from a diameter		A1	
	(b)	isosceles triangle		A1	
		tangents from a point are equal in length		A1	
	(c)	angle DAC = $x°$		M1	
		angle BAC = $(90 – x)°$		A1	6 marks
5.	(a)	$\frac{2}{2+3} \times £100$		M1	
		£40		A1	
	(b)	£100 – £39.75 = £60.25		M1	
		b = (60.25 ÷ 39.75) × 241		M1	
		b = 241		A1	5 marks
6.	area of triangular face = ½ × 8 × 2 = 8cm^2			M1	
	slant height = $\sqrt{2^2 + 4^2} = \sqrt{20}$cm			M1	
	surface area = 2 × 8 + 2 × 1.5 × √20 + 1.5 × 8			M1	
	41.4cm^2			A1	4 marks
7.	(a)	m – 3 = 3j		M1	
		j = ⅓ (m – 3)		A1	
	(b)	$\frac{3V}{\pi} = r^3$		M1	
		$r = \sqrt[3]{\frac{3V}{\pi}}$		A1	
	(c)	pw – w = 1		M1	
		w(p – 1) = 1		M1	
		w = 1/(p – 1)		A1	7 marks
8.	(a)	all points correctly plotted		B1	
	(b)	straight line drawn		B1	
		accurate line drawn in appropriate position		B1	
	(c)	positive correlation (moderate)		A1	
	(d)	method lines seen on graph		M1	
		60 – 68		A1	6 marks
9.	(a)	$(x + 2)(x + 3)$		A1	
		$(x +2)(x + 3) = 0$, $x = –2$ or $x = –3$		A1 A1	
	(b)	(i)	$2x + 3 = 3x – 3$		
			$x = 6$	M1A1	
		(ii)	$x = \frac{12}{14} = \frac{6}{7}$	A1	

(c) $2 + 3x < 17x$
$2 < 14x$ — M1
$x > \frac{1}{7}$ — A1 — 8 marks

10 (a)

x	–2	–1	0	1	2	3
$y = x^2 - 2x - 2$	6	**1**	**–2**	–3	**–2**	1

all values correct — A1
(b) points correctly plotted — A1
smooth curve drawn through points — A1
(c) $x = -0.75 \pm 0.05$, or between 2.75 ± 0.05 — A1A1ft — 5 marks
(numerical is –0.73, 2.73).

11. a)

x	–3	–2	–1	0	1	2	3
$y = 2x^2 + 4x - 8$	–2	**–8**	**–10**	–8	**–2**	**8**	22

A1A1

b) Suitable and correct axis for value — A1
Correct graph plotted — A1
Joined by smooth curve — A1

c) reading off values which intersect with x-axis, $x = 1.2$ — A1
by symmetry $x = -3.2$ (or rounding to same) — A1ft
[also accept $x =$ less than 1.3 but rounding to 1.3 or $x =$ more than –3.3 and rounding to –3.3 A1A1]

d) Line $y = -4$ drawn on; — M1
$x = 0.7$ or $x = -2.7$ (or rounding to same) — A1ft A1ft — 10 marks
[also accept $x =$ less than 0.8 and rounding to 0.8 or $x =$ more than –2.8 and rounding to –2.8 A1A1]

12. Least upper bound $= (200 \div 8.5) \times (50 \div 4.5)$
$= 23 \times 11$
$= 253$ — A1

M1 **consistent rounding down to whole number**

The alternative tessellation gives 220 (44×5)
Greatest lower bound $= (200 \div 9.5) \times (50 \div 5.5)$
$= 21 \times 9$
$= 189$ — A1

The alternative tessellation gives 180 (36×5). — **B1** for calculating any correct pair of tessellation answers 253/220, 189/180 — 4 marks

13. a) $\frac{120}{x} + \frac{120}{x+10}$ (hours) — **B1 for either expression seen** +A1

b) $5 = \frac{120}{x} + \frac{120}{x+10}$ — A1 ft

c) $5 = \frac{240x + 1200}{(x)(x+10)}$ — M1 any correct multiplication

$5x^2 + 50x = 240x + 1200$ — M1 2nd correct multiplication
$5x^2 - 190x - 1200 = 0$ — M1 simplification
$x^2 - 38x - 240 = 0$ as required — A1

d) $x = \frac{-(-38) \pm \sqrt{(-38)^2 - (4 \times 1 \times -240)}}{2 \times 1}$ — M1

$x = \frac{38 \pm \sqrt{2404}}{2}$

$x = 43.515\ldots = 43.5$km/h (discard negative root) — A1
$\therefore$ return speed $= x + 10 = 53.5$km/h to 3sf as required — A1 ft — 9 marks

14.	a)	$30 = k \times 60^2$	M1	
		$k = 8\frac{1}{3} \times 10^{-3} = 1/120$	M1	
		$t = \dfrac{s^2}{120}$	A1	
	b)	$t = \dfrac{45^2}{120}$	M1	
		$t = 16.875 = 17$ to the nearest whole number as required	A1	5 marks
15.	a)	$PD^2 = PL^2 + LD^2 - 2 \times PL \times LD \times \cos 127$	M1	
		$PD^2 = 6.9^2 + 14^2 - 2 \times 6.9 \times 14 \times \cos 127$		
		PD = 18.9705…km accept any number rounding to 19.0km	A1	
	b)	$\dfrac{\sin 127}{18.97...} = \dfrac{\sin LPD}{14}$	M1	
		$\sin LPD = 14 \times \dfrac{\sin 127}{18.97...} = 0.5893827\ldots$	M1	

LPD = 36.113216… , Bearing = $180 - LPD = 180 - 36.11... = 143.9°$ to 1d.p. as required A1 — 5 marks

16.	a)	DAB = x°		
		ADC = 180– x° (parallel lines, C-angle)	M1 - with explanation	
		DCB = 180– x° (cyclic quadrilateral)	M1- with explanation	
		EDC = ECD = x° (angles on straight line)		
		∴ triangle EDC isosceles	A1 - correct proof.	
	b)	PAB = 133–x (angles on a straight lines)		
		ACB = (133–x)° (alternate segment)	M1A1	5 marks
17.	a)	$\overrightarrow{ST} = \mathbf{c} - \mathbf{a}$	A1	
	b)	PU = $\mathbf{a} + \mathbf{c}$	A1	
	c)	½ ($\mathbf{a} - \mathbf{c} + \mathbf{b}$)	A1	
	d)	½ ($\mathbf{a} + \mathbf{b}$)	A1	4 marks
18.	a)	i) $P = (^1/_{10})^4 = 0.0001$	A1	
		ii) $P = 10(^1/_{10})^4 = 0.001$	M1A1	
	b)	$P = 10(^1/_{10})^n$ **OR** $(^1/_{10})^{n-1}$ or equivalent	A1	4 marks
19.	a)	New heights are 12, 4 respectively	A1 for either	
		Plotting correct height polygons with correct widths		
		(20 -> 30 = 12 units, 30 -> 45 4 units)	A1A1	
	b)	missing numbers in table are 48, 56.		
		170 – (16 + 48 + 56 + 24 + 12) = 14	A1	4 marks