

1. 4024/11/M/J/16 Q24

24	(a) (i)	$\frac{20}{T}$ oe	1	
	(ii)	5	1	
	(b) (i)	15	1	
	(ii)	Curve, concave down, from (0, 0) to (T, 150)	1	

2. 4024/12/M/J/16 Q3

3	(a)	Ruled straight line through (0, 0) and (100, 56)	1	
	(b)	35 to 37	1	

3. 4024/12/M/J/16 Q18

18	(a)	16	1	
	(b)	160 or $10 \times \text{their (a)}$	2ft*	M1 for $0.5 \times \text{their } v \times (8 + 12)$ oe or $0.5 \times \text{their } v \times 4 + \text{their } v \times 8$ oe

4. 4024/21/M/J/16 Q3

3	(a)	Correct graph	2	B1 for correct scales and 4 points or wrong scales and all points.
	(b) (i)	-2.3 ± 0.5 1.3 ± 0.5	1	
	(ii)	-2.8 ± 0.5 1.8 ± 0.5	2	M1 for $x^2 + x - 3 = 2$ soi
	(c)	2.4 to 3.6	2	M1 for tangent at $x = 1$
	(d) (i)	$y = 2x - 2$	2	B1 for $2x$ or -2
	(ii)	-0.6 1.6	2	Dependent on line drawn B1 for their line having FT gradient or FT intercept

5. 4024/22/M/J/16 Q8

8	(a)	0.5	1	
	(b)	Correct graph with smooth curve	2	B1 for at least 4 correct points
	(c)	Tangent drawn and gradient = 2.3 to 3.0	2	B1 for tangent drawn at $x = 4$ or B1 for gradient 2.3 to 3.0
	(d) (i)	Correct method to eliminate y <u>and reaching the given equation</u> without error including at least one intermediate line	1	
	(ii)	2.3 to 2.4 dep on line drawn	2	B1 for $2x + y = 6$ drawn
	(e) (i)	$\frac{1}{3}$ or 0.33..	1	
	(ii)	Tangent gradient roughly $\frac{1}{3}$	1	
	(iii)	$y = \frac{1}{3}x + k$ oe where $0 < k < 0.25$	2ft	Ft from their e(i) B1 for $\frac{1}{3}x + k$ oe where $0 < k < 0.25$ or $y = \frac{1}{3}x + k$ oe (any k outside range)

6. 4024/11/O/N/16 Q22

22	(a)	10.4 or any equivalent	2 *	M1 for $\frac{v-4}{8} = \frac{8}{10}$ oe or B1 for 6.4 oe; or for 1.6 oe; seen
	(b)	80	2 *	C1 for 140 or M1 for $10 \times (4 + 12)/2$ oe
	(c)	Curve, concave upwards, from (0, 0) to (10, their(b))	1 ✓	independent
		Straight line from (10, their(b)) to (15, 60 + their(b))	1 ✓	independent

7. 4024/12/O/N/16 Q27

27	(a)	(-)-0.9 oe	1	
	(b)	420	2*	M1 for $\frac{1}{2} \times 20 \times (12 + 30)$ oe
	(c)	25	2*	M1 for $(k - 20) \times 12 = 60$ oe or C1 for $k = 5$

8. 4024/21/O/N/16 Q8

8 (a)	0.2 or 0.21[2...]	1	
(b)	Correct axes Correct shape curve through 9 correct points	B1 B2	B1ft for at least 7 correct points plotted
(c)	Clear, correct, tangent drawn 2.2 to 2.5	M1 A1	
(d) (i)	Ruled line from (-0.4, 0) to (2, 3.6)	1	
(ii)	$y = 1.5x + 0.6$ or $y = \frac{3}{2}x + \frac{3}{5}$	2	B1 for $m = 1.5$ oe or for $c = 0.6$ oe or for correct equation in a different form
(iii)	0 and 3.1 to 3.2	1ft	FT intersections of <i>their</i> ruled line with <i>their</i> curve
(iv)	$A = 2.4$ to 2.6 $B = 1$	1 1	

9. 4024/11/M/J/17 Q20

20(a)	11	1	
20(b)	30	1	
20(c)(i)	line joining (1125, 25) to (1155, 0)	1	
20(c)(ii)	1136 – 1137	1	Ft their line with negative gradient

10. 4024/12/M/J/17 Q18

18(a)	18	2	M1 for $\frac{v-12}{15}$ or $\frac{12-v}{15}$ oe
18(b)	345	2	B1FT for a correct partial area: 120 or 225 or 300 or 45 or 180 or M1FT for $12 \times 25 + 0.5 \times 15 \times (\text{their } 18 - 12)$ oe

11. 4024/21/M/J/17 Q5

5(a)	17	1	
5(b)	Smooth curve through 7 correct points	3	Mark the curve first B2 for at least 5 ft plots correct B1 for at least 4 ft plots correct
5(c)	-1.7 to -1.4, -0.5 to -0.2, 1.7 to 2.0	2	FT B1 for 2 correct
5(d)	3 to 5 with tangent drawn	2	B1 for ruled solid tangent drawn
5(e)(i)	Correct ruled line drawn	1	
5(e)(ii)	$a = 7, b = 4$	2	B1 for one correct or $a = 6.8$ to 7.2 and $b = 3.8$ to 4.2
5(e)(iii)	-2.4 to -2.1 or -0.7 to -0.5	1	FT

12. 4024/22/M/J/17 Q5

5(a)	$\frac{9}{10x}$ final answer	1	
5(b)	$7x - 5y + 3$ final answer	2	B1 for $7x - 5y + 3$ seen or two of $7x, -5y, 3$ in final answer
5(c)	-1.14, 1.47 final answers	3	B2 for $\frac{-(-1) \pm \sqrt{(-1)^2 - 4 \times 3 \times -5}}{2 \times 3}$ oe or B1 for $\frac{-(-1) \pm \sqrt{p}}{2 \times 3}$ oe or $\frac{q \pm \sqrt{(-1)^2 - 4 \times 3 \times -5}}{r}$ oe
5(d)(i)	Ruled line through (0,2.5) and (5, 0)	2	B1 for 'correct' freehand line or line with a gradient of -0.5 or line through (0, 2.5) with negative gradient or line through (5, 0) with negative gradient
5(d)(ii)	Correct region unambiguously identified	1	FT provided <i>their</i> straight line with negative gradient and the 3 given lines form a quadrilateral below $y = 4$
6(a)	7.387 to 7.392	2	M1 for $\sin 38 = \frac{PQ}{12}$ soi or $\frac{PQ}{\sin 38} = \frac{12}{\sin 90}$ soi

13. 4024/11/O/N/17 Q22

22(a)	$\frac{v}{10}$ oe	1	
22(b)	20 nfw	3	M1 for $\frac{1}{2} \times (40 + 80) \times v$ oe or B1 for two of $15v, 40v, 5v$. M1 for <i>their</i> $60v = \text{their}(1200)$

14. 4024/12/O/N/17 Q24

24(a)	21	1	
24(b)	$\frac{18}{20}$ oe	1	
24(c)	420	2	M1 for a correct, complete, method to find the area. e.g. $\frac{1}{2} \times (30 + 12) \times (60 - 40)$; $12 \times (60 - 40) + \frac{1}{2} \times (60 - 40) \times (30 - 12)$; $(60 - 40) \times 30 - \frac{1}{2} \times (60 - 40) \times (30 - 12)$

15. 4024/21/O/N/17 Q7b

7(b)(i)	3.5	1	
7(b)(ii)	Correct smooth curve through 8 correct points	3	B2FT for 7 or 8 points correctly plotted or B1FT for 5 or 6 points correctly plotted
7(b)(iii)	Clear correct tangent drawn at (1, 1)	M1	
	-2.4 to -1.6	A1	
7(b)(iv)	0.6 to 0.8 and 4.2 to 4.4	2	FT reading from <i>their</i> graph at $y = 2$ B1 for one correct or for $y = 2$ soi

16. 4024/22/O/N/17 Q7

7(a)(i)	-4.5 -4.5	1	Both correct
7(a)(ii)	Correct smooth curve	3FT	B2FT for 8 or 9 points correctly plotted Or B1FT for 6 or 7 points correctly plotted Or B1 for the correct scales drawn
7(a)(iii)	-2.4 to -1.6 dependent on tangent drawn	2	Accept a correctly formed $\Delta y \div \Delta x$ isw B1 for tangent drawn at (3, 1.5)
7(a)(iv)(a)	-2 cao		
7(a)(iv)(b)	-2.4 to -2.3 and 4.3 to 4.4		FT reading their graph at $y = \text{their } -2$ Tolerance ± 1 small square B1 FT for one correct
7(b)(i)	4	1	
7(b)(ii)	3	1	
7(b)(iii)	324	1	

17. 4024/11/M/J/18 Q18

18(a)	BC: constant speed 18 m/s for 50 s CD: deceleration 1.2 m/s ² for 15 s	3	B1 for BC correct and B2 for CD completely correct or B1 for CD with one error or omission If 0 marks scored then SC1 for BC is constant speed and CD is deceleration
18(b)	1215	2	M1 for $\frac{1}{2} \times 18 \times (50 + 85)$ oe or one correct area : 180 or 900 or 135 or SC1 for answer 1080

18. 4024/12/M/J/18 Q25

25(a)	$\frac{u}{10}$	1	
25(b)	$\frac{u}{2}$	1	
25(c)	$55u$	2	M1 for attempt to find a relevant area under the graph, so i by $50u$ or $5u$ or $60u$

19. 4024/22/M/J/18 Q6

6(a)	5.5, 5.5 oe	1	Both correct
6(b)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
6(c)	tangent drawn at $x = 1.5$	B1	Dependent on a curve drawn between $x = 1$ and $x = 2$
	-1.7 to -1.3	B1	
6(d)	$x \leq 0.6$ to 0.9 $x \geq 5.1$ to 5.4	2	B1 for one correct or SC1 for answers reversed
6(e)(i)	Ruled line passing through (0, 3) and (4, 0) crossing curve twice	2	B1 for short or unruled line or for two correct points plotted
6(e)(ii)	$A = -9, B = -4$	2	B1 for either correct or $2x^2 - 9x - 4 [=0]$ or M1 for $\left(\frac{x^2}{2} - 3x + 2\right) = \frac{12 - 3x}{4}$ oe After 0, SC1 for $A = -9.2$ to -8.8 and $B = -4.2$ to -3.8

20. 4024/11/O/N/18 Q24

24(a)	2.4 oe final answer	1	
24(b)	32	1	
24(c)	16 nfw	3	M2 for $\frac{1}{2} \times (44 + 20) \times 10$ oe = 20k oe or M1 for $\frac{1}{2} \times (44 + 20) \times 10$ oe, or for 20k oe = <i>their</i> distance travelled from $t = 0$ to $t = 10$

21. 4024/12/O/N/18 Q24

24(a)	ruled line from (0, 0) to (30, 20) and ruled line from (30, 20) to (90, 20) and ruled line from (90, 20) to (110, 0)	2	B1 for a graph with one error
24(b)	1700 nfw	2	M1 for a correct attempt to find a relevant area under the graph, or B1 for two of 300, 1200, 200.

22. 4024/21/O/N/18 Q5

5(a)	-1.6 oe	1	
5(b)	Correct smooth curve	3	B2FT for 7 or 8 points correctly plotted or B1FT for 5 or 6 points correctly plotted
5(c)(i)	Tangent drawn at (-2, 0.8)	B1	
5(c)(ii)	-3.1 to -2.2	B1	Dependent on tangent drawn at $x = -2$
5(d)	-2.5 to -2.3 1.4 to 1.6 2.7 to 2.9	3	FT reading <i>their</i> graph at $y = 2$ Tolerance ± 1 mm B1 for each one correct After 0 scored, SC1 for $y = 2$ soi

23. 4024/22/O/N/18 Q6

6(a)	Acceptable justification eg Length = $\frac{18}{x}$ leading to answer or $y = x + x + \frac{18}{x}$	1	
6(b)(i)	20, 13, 20	2	B1 for two correct
6(b)(ii)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
6(c)	1.6 to 1.8 and 5.2 to 5.4	2	FT reading their graph at $y = 14$ Tolerance ± 1 mm B1FT for one correct
6(d)(i)	240	2	B1 for $y = 12$ soi
6(d)(ii)	7.4 to 7.7	2	B1 for 17.5 soi

24. 4024/12/M/J/19 Q9

9(a)	Correct graph	2	B1 for ruled line from (0, 0) to (20, 15) B1 for ruled line from (<i>their</i> 20, 15) to (<i>their</i> 20+ 40, 15)
9(b)	0.75 oe	1	

25. 4024/22/M/J/19 Q7

7(a)	1.25 oe	1	
7(b)	Correct smooth curve	2	B1FT for at least 6 points correctly plotted
7(c)	$y = -\frac{1}{5}x + 2.4$ oe final answer	3	M1 for $\frac{d-b}{c-a}$ from correct (a, b) and (c, d) M1 for correct method to find y intercept
7(d)	line drawn through (1, 3) with negative gradient, crossing the curve twice	B1	
	5.8 to 6.2	B1	

26. 4024/11/O/N/19 Q23

23(a)	$\frac{3}{5}$ oe	1	
23(b)	6	1	
23(c)	640	2	M1 for $\frac{1}{2} \times 20 \times (24 + 40)$ oe

27. 4024/12/O/N/19 Q25

25(a)	3.2 oe	1	
25(b)	240	2	M1 for $\frac{1}{2} \times 10 \times (8 + 40)$ oe
25(c)	28	2	M1 for $(60 - 10) \times 0.4$ oe or for $0.4 = \frac{v-8}{60-10}$ oe

28. 4024/21/O/N/19 Q8

8(a)	$x - 4$	1	
8(b)	$CB = \text{area} \div \text{length} = \frac{80}{x}$ and $CQ = CB - 4$ oe	1	
8(c)	$[y =]80 - \frac{1}{2}(x-4)\left(\frac{80}{x} - 4\right)$	M1	FT <i>their</i> expression from (a)
	$80 - \frac{320}{x} - 4x + 16$	M1	FT <i>their</i> expression from (a) of the form $ax + b$
	Correct working leading to $y = 32 + 2x + \frac{160}{x}$ AG	A1	
8(d)	74	1	
8(e)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
8(f)	67.4 up to but not including 68	1	

29. 4024/22/O/N/19 Q4

4(a)	-1.8	1	
4(b)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
4(c)	Tangent drawn at (1, 4.8)	B1	Dep on <u>curve</u> drawn between (0, 3) and (2, 5.4)
	1.2 to 1.6	B1	Dep on close attempt at tangent
4(d)(i)	Ruled line through (-2, 5) to (2, 3) crossing curve three times	2	B1 for short or unruled line or for two correct coordinates soi
4(d)(ii)	-3.8 to -3.7 0.4 to 0.5 3.3 to 3.4	2	FT intersection of <i>their</i> line with <i>their</i> 'curve' B1FT for two correct
4(d)(iii)	$A = -25$ $B = 10$	3	B2 for one correct or M1 for $\frac{8-x}{2} = 3 + 2x - \frac{x^3}{5}$ oe

30. 4024/12/M/J/20 Q18

18(a)	12	2	M1 for $0.2 = \frac{v}{(200-140)}$ oe
18(b)	40	3	M2 for $\frac{1}{2} \times (200 + 140 - T) \times \text{their } 12 = 1800$ oe or M1 for correct partial area e.g. $\frac{1}{2} \times T \times \text{their } 12$ or $(140 - T) \times \text{their } 12$ or $\frac{1}{2} \times (200 - 140) \times \text{their } 12$

31. 4024/21/M/J/20 Q6

6(a)(i)	4.75 oe	1	
6(a)(ii)	Correct curve	3	B2FT for 6 or 7 points correctly plotted or B1FT for 4 or 5 points correctly plotted
6(a)(iii)(a)	Ruled line through (0, 1), gradient 1/3	2	B1 for 'correct' freehand line or ruled line with positive gradient through (0, 1) or ruled line with gradient 1/3
6(a)(iii)(b)	-2.5 to -2.1, 0, 2.1 to 2.5	2	B1 for two correct
6(a)(iii)(c)	$A = 3, B = 16$	2	B1 for either correct or $\frac{1}{3}x + 1 = \frac{x^3}{4} - x + 1$ or better
6(b)	$y = 2x^2$ $y = 2x^2 - 2$ $y = x^2 - 2x$	2	B1 for one correct

32. 4024/22/M/J/20 Q7

7(a)(i)	1, 2	1	
7(a)(ii)	Correct curve	3	B2FT for 6 or 7 points correctly plotted or B1FT for 4 or 5 points correctly plotted
7(a)(iii)	Tangent drawn at (2, 16)	B1	
	18 to 27	B1	Dependent on correct tangent or close attempt
7(a)(iv)(a)	$a = -60, b = 36$	2	B1 for either correct or $3(4^x) - 60x + 36 [= 0]$
7(a)(iv)(b)	$y = 20x - 12$ ruled line	M2	M1 for one correct coordinate soi
	0.7 to 0.8, 2.65 to 2.75	B1	
7(b)	$p = 1$	B1	
	$q = 9$	B2	M1 for $[y =] (4 - x)(x + 2)$ oe or $[y =] q - (x - 1)^2$ oe or two correct equations in x and y using $(-2, 0), (4, 0)$ or $(0, 8)$ or SC1 for $q = -9$

33. 4024/11/O/N/20 Q23

23(a)	$\frac{1}{3}$	1	
23(b)	70	1	
23(c)	14	3	B2 for total distance = 1400 OR M1 for total distance = $\frac{1}{2} \times 20 \times (40 + 100)$ oe M1 for Average speed = $\frac{\text{their}(\text{distance})}{100}$

34. 4024/12/O/N/20 Q18

18(a)	5	1	
18(b)(i)	line from (08 30, 0) to (08 45, 1200)	1	
18(b)(ii)	400	1	FT <i>their(b)(i)</i>
18(c)	4.8 or $4\frac{4}{5}$ or $\frac{24}{5}$	2	M1 for $\frac{\text{figs}12}{\frac{1}{4}}$ oe or $\frac{\text{figs}12}{15}[\times 60]$ oe or $\frac{\text{figs}12}{900}\times 60[\times 60]$ oe

35. 4024/21/O/N/20 Q4

4(a)	0.1 oe	1	
4(b)	Correct smooth curve	3	B2FT for 6 or 7 points correctly plotted or B1FT for 4 or 5 points correctly plotted
4(c)	Tangent drawn at (2, 3.2)	B1	
	1.8 to 2.4	B1	Dependent on close attempt at tangent
4(d)	0.25 to 0.4	1	

36. 4024/22/O/N/20 Q3

3(a)	2.04 or 2.035 to 2.036	1	
3(b)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
3(c)	Tangent drawn at (1, 2.25)	B1	
	-2 to -1.1	B1	Dependent on close attempt at tangent
3(d)(i)	Ruled line through (0, 3) and (6, 0)	2	B1 for short or unruled line or for two correct points soi or line with negative gradient passing through (0, 3)
3(d)(ii)	Reading at intersections of line with curve	2	Strict FT intersections of <i>their</i> line with <i>their</i> curve B1FT for each
3(d)(iii)	$A = -12$ $B = 8$	3	B2 for $6x^2 - 24x + 16 [= 0]$ or $3x^2 - 12x + k [= 0]$ or $3x^2 - kx + 8 [= 0], k \neq 0$ or M1 for using given equations to form an equation in x $3 - \frac{x}{2} = \frac{x}{4} + \frac{2}{x}$ oe or $2\left(\frac{x}{4} + \frac{2}{x}\right) + x = 6$ oe

37. 4024/12/M/J/21 Q12

12(a)	16 nfw	3	B1 for [total distance =] 24 used or [total time =] 1.5 hours oe used M1 for figs $24 \div$ <i>their</i> total time
12(b)	Correct graph	2	B1 for line from (0, 10) to (80, 10) B1FT for line from <i>their</i> (80, 10) with gradient -0.5

38. 4024/21/M/J/21 Q7

7(a)	$[y =] 2x - 1$ $[y =] -2x + 1$	2	B1 for one correct
7(b)	$a = 1$ $b = -6$	2	B1 for one correct or $(x + 3)(x - 2)$ or better seen or $0 = 4 + 2a + b$ oe <u>and</u> $0 = 9 - 3a + b$ oe
7(c)(i)	8 to 8.5, -4.3 to -3.8	2	B1 for one correct
7(c)(ii)	Ruled line $y = 2x + 1$	M2	M1 for short or unruled line or $2x + 1$ seen
	Reading the three x values of intersections between <i>their</i> non-horizontal ruled line and given curve	B2	B1 for reading two correct After B0 scored, SC1 for 3 correct with no/incorrect line

39. 4042/12/O/N/21 Q14

14(a)	$\frac{15}{20}$ oe	1	
14(b)	Speed is constant oe	1	
14(c)	500 nfw	3	B2 for answer 400 OR M2 for complete method to find total area under the graph e.g. $\frac{1}{2}(10 + 30) \times 15 + \frac{1}{2}(5 + 15) \times 20$ oe or M1 for correct method to find a relevant area under the graph soi

40. 4024/21/O/N/21 Q7

7(a)	Correct smooth curve	4	B3 for 4 or 5 correct points or B2 for 2 or more correct pairs of values soi or B1 for one correct pair of values soi
7(b)(i)	Tangent drawn at $x = 0.5$	B1	
	-5.5 to -2.8	B1	Dependent on close attempt at tangent
7(b)(ii)	-0.45 to -0.35	1	
7(b)(iii)	Line $y = 7 - x$ ruled	M2	M1 for $\frac{1}{2x^2} + 3x = 7 - x$ or for line $y = k - x$ or $y = 7 + mx$ drawn, $m \neq 0$
	-0.2 to -0.3 0.2 to 0.4 1.6 to 1.8	A2	A1dep for one correct, dep on at least M1 After A0 scored SC1 for all 3 correct with no or wrong working

41. 4024/22/O/N/21 Q3

3(a)	-5.5 or $-5\frac{1}{2}$ or $-\frac{11}{2}$	1	
3(b)	Correct smooth curve	3	B2FT for 6 or 7 points correctly plotted or B1FT for 4 or 5 points correctly plotted
3(c)	Line $y = 3$ only intersects the graph once oe	2	M1 for $\frac{x^3}{2} - 3x - 1 = 3$ soi or $y = 3$ soi
3(d)(i)	Ruled line through (1, 1) and (-2, -1)	1	
3(d)(ii)	$\frac{2}{3}$ nfw	2	M1 for gradient = $\frac{1+1}{1+2}$ oe
3(d)(iii)	FT reading three x -values where <i>their L</i> intersects <i>their</i> curve	2	B1FT for two correct

42. 4024/12/M/J/22 Q16

16(a)	Tangent drawn at $x = -1$	B1	
	-3 to -2	B1	Dep on close attempt at tangent at $x = -1$
16(b)	-3.9 to -3.8 0 3.8 to 3.9	3	B1 for each If 0 scored, M1 for line $y = 2$ drawn at least from $(-1, 2)$ to $(1, 2)$ If 0 scored, SC1 for answers $(-3.9 \text{ to } -3.8, 2)$ and $(0, 2)$ and $(3.8 \text{ to } 3.9, 2)$

43. 4024/21/M/J/22 Q5

5(a)	-12	1	
5(b)	Correct smooth curve	3	B2FT for 6 or 7 points correctly plotted or B1FT for 4 or 5 points correctly plotted
5(c)	Ruled line $y = 5$	M1	
	-1.8 to -1.5 -0.6 to -0.3 2.1 to 2.5	A2	A1 for two correct After 0 scored, SC1 for three correct solutions or $x^3 - 4x + 3 = 5$ soi or for three correct solutions from their horizontal line drawn

44. 4024/22/M/J/22 Q7

7(a)(i)	0.75 or $\frac{3}{4}$ or $\frac{6}{8}$	1	
7(a)(ii)	Travelling at a constant/uniform speed oe or Travelling at acceleration of 0 oe	1	
7(a)(iii)	104	3	M2 for $\frac{1}{2} \times 6 \times (T + (90 - 8)) [= 558]$ oe or $\frac{1}{2}(T - 90) \times 6 = 42$ oe or $\frac{1}{2} \times 6 \times ((90 - 8) + T - 8) = 534$ oe or M1 for $\frac{1}{2} \times 8 \times 6$ oe or $(90 - 8) \times 6$ oe or $\frac{1}{2}(90 + (90 - 8)) \times 6$ oe seen After 0 scored, SC1 for answer 14
7(a)(iv)	21.6 or $21\frac{3}{5}$ cao	2	B1 for answer figs 216 or M1 for $\frac{6}{1000} \times 60 [\times 60]$ oe
7(b)	84.9 or 84.93 to 84.94 nfw	3	B1 for 352.5 or 4.15 seen M1 for $\frac{\text{their}352.5}{\text{their}4.15}$

45. 4024/11/O/N/22 Q17

17(a)	$\frac{20}{120}$ oe	1	
17(b)	16	3	<p>B2 for total distance = 9600 OR M1 for total distance = $\frac{(360 + 600)}{2} \times 20$ or $\frac{1}{2} \times 20 \times 120 + 20 \times 360 + \frac{1}{2} \times 20 \times 120$ oe M1 for average speed = $\frac{\text{their}9600}{600}$</p>

46. 4024/21/O/N/22 Q 3

3(a)	6.5 oe	1	
3(b)	Correct smooth curve	3	B2FT for 6 or 7 points correctly plotted or B1FT for 4 or 5 points correctly plotted
3(c)	Coordinates of minimum of <i>their</i> curve	2	Dependent on a single local minimum below the x-axis B1 for one correct After 0 scored, SC1 for (3, <i>their</i> negative $y < -0.5$)
3(d)	Reading at $y = 0$	2	B1 for two correct values

47. 4024/22/O/N/22 Q3

3(a)	$h = \frac{60}{x^2} \text{ seen}$ $xh = \frac{60}{x} \text{ seen}$	M1	
	$[A=]2x^2 + 4x \times \frac{60}{x^2} \rightarrow 2x^2 + \frac{240}{x}$ $[A=]2x^2 + 4 \times \frac{60}{x} \rightarrow 2x^2 + \frac{240}{x}$	A1	A0 if any errors A0 if any errors
3(b)	98 112	2	B1 for each
3(c)	Correct smooth curve	3	B2FT for 7 or 8 points correctly plotted or B1FT for 5 or 6 points correctly plotted
3(d)	90 to 92	1	FT <i>their</i> minimum point provided ≤ 92
3(e)	x, x, h where $2.1 \leq x \leq 2.3$ with corresponding h	3	M1 for a correct reading of <i>their</i> graph at $A = 120$ M1 for $\frac{60}{(\text{their}2.2)^2}$ or $\frac{120 - 2 \times (\text{their}2.2)^2}{4 \times \text{their}2.2}$