

Formulae

Foundation and Higher tiers

Total marks: 83

Marks

- M** Method mark, for a correct method. It can be implied by a correct answer.
- A** Accuracy mark, for a correct answer. It needs the method mark before it.
- B** A mark for a correct value or statement, with or without working.
- ft** Follow through: the mark is given for using an earlier wrong answer correctly.
- oe** Or equivalent.
- [a, b]** Any value from a to b inclusive.

Questions

Q	Skill	Spec	Tier	Grade	Calculator	Marks
1	Using a word formula, forwards and backwards	A2	Foundation	2	No	3
2	Substituting into a formula	A2 A5	Foundation	3	No	4
3	Writing a formula from a context	A21 A5	Common	3	No	2
4	Changing the subject	A5	Foundation	4	No	2
5	Choosing the correct rearrangement	A5	Foundation	4	No	1
6	Substituting a negative decimal	A2	Foundation	4	No	2
7	Spotting a mistake in a rearrangement	A5	Foundation	5	No	2
8	Substituting, then solving	A2 A17	Common	5	No	3
9	Changing the subject when it is squared	A5	Foundation	5	No	2
10	Changing the subject when it appears twice	A5	Foundation	7	No	3
11	Changing the subject of a fraction	A5	Higher	8	No	4
12	Substituting decimals into a formula	A2	Foundation	2	Yes	2
13	Using a word formula with decimals	A2	Foundation	2	Yes	2
14	Substituting decimals and a negative into a formula	A2	Foundation	2	Yes	3
15	Substituting into a formula with a product	A2	Foundation	2	Yes	2
16	Substituting into formulae with powers	A2	Foundation	2	Yes	3

Q	Skill	Spec	Tier	Grade	Calculator	Marks
17	Substituting into a formula with a fraction	A2	Foundation	2	Yes	2
18	Substituting into a formula with a subtraction	A2	Foundation	2	Yes	2
19	Substituting into a formula with a squared term	A2	Foundation	3	Yes	2
20	Using a word formula with money, forwards and for a budget	A2	Foundation	3	Yes	4
21	A word formula, with time in hours and minutes	A2	Foundation	3	Yes	3
22	Using a word formula backwards	A2 A17	Foundation	3	Yes	3
23	A conversion formula, used to compare	A2	Foundation	3	Yes	3
24	Writing a formula, then using it to decide	A21 A5 A2	Common	3	Yes	4
25	Rearranging a formula with π	A5 A2	Foundation	3	Yes	3
26	Substituting into a formula with a fraction	A2	Foundation	3	Yes	2
27	A word formula with two inputs, used to compare	A2	Foundation	3	Yes	3
28	Using a formula forwards and backwards	A2 A17	Foundation	3	Yes	4
29	Substituting into a scientific formula	A2	Foundation	4	Yes	3
30	A formula with a square root	A5 A2	Foundation	6	Yes	5
	Total					83

Question 1 A2 · Foundation · Grade 2 · 3 marks

Q	Answer	Mark	Comments
1(a)	£22	B1	
1(b)	$(40 - 4) \div 6$ or $36 \div 6$	M1	oe, or a correct trial such as $6 \times 5 + 4 = 34$
	6	A1	

Question 2 A2 A5 · Foundation · Grade 3 · 4 marks

Q	Answer	Mark	Comments
2(a)	$5 \times 4 - 2 \times -3$ or $20 + 6$	M1	oe
	26	A1	
2(b)	$31 = 5n - 4$ or $\frac{31+4}{5}$	M1	oe
	7	A1	

Question 3 A21 A5 · Common · Grade 3 · 2 marks

Q	Answer	Mark	Comments
3	$C = 9n + 2.5$	B2	oe, such as $C = 9n + 2.50$. B1 for $9n + 2.5$ with no $C =$, or for $C = 9n + k$ or $C = kn + 2.5$

Question 4 A5 · Foundation · Grade 4 · 2 marks

Q	Answer	Mark	Comments
4	$w + 9 = 5t$	M1	oe
	$t = \frac{w+9}{5}$	A1	oe, such as $t = \frac{w}{5} + \frac{9}{5}$

Question 5 A5 · Foundation · Grade 4 · 1 mark

Q	Answer	Mark	Comments
5	$m = \frac{k}{3} + 2n$	B1	

Question 6 A2 · Foundation · Grade 4 · 2 marks

Q	Answer	Mark	Comments
6	$6 \times 4 + \frac{1}{2} \times -2.5 \times 4^2$ or $24 - 20$	M1	oe
	4	A1	

Question 7 A5 · Foundation · Grade 5 · 2 marks

Q	Answer	Mark	Comments
7(a)	She should add 5 to both sides (to get $4y + 5 = 2x$)	B1	oe
7(b)	$x = \frac{4y+5}{2}$	B1	oe, such as $x = 2y + \frac{5}{2}$

Question 8 A2 A17 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
8	$6 = \frac{10v}{10+v}$	M1	oe, substitution
	$60 + 6v = 10v$	M1	oe, the fraction cleared
	15	A1	

Question 9 A5 · Foundation · Grade 5 · 2 marks

Q	Answer	Mark	Comments
9	$2E = mv^2$ or $v^2 = \frac{2E}{m}$	M1	oe
	$v = \sqrt{\frac{2E}{m}}$	A1	oe, accept $\pm$

Question 10 A5 · Foundation · Grade 7 · 3 marks

Q	Answer	Mark	Comments
10	$3p - pc = -2 - b$	M1	oe, the p terms on one side and the others on the other side
	$p(3 - c) = -2 - b$	M1	oe, p taken out as a factor
	$p = \frac{b+2}{c-3}$	A1	oe, such as $p = \frac{-2-b}{3-c}$

Question 11 A5 · Higher · Grade 8 · 4 marks

Q	Answer	Mark	Comments
11	$y(x - 3) = x + 2$ or $xy - 3y = x + 2$	M1	oe
	$xy - x = 3y + 2$	M1	oe, the x terms on one side
	$x(y - 1) = 3y + 2$	M1	oe
	$x = \frac{3y+2}{y-1}$	A1	oe, such as $x = \frac{-3y-2}{1-y}$

Question 12 A2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
12	6.85×18.6 or 127.41	M1	oe
	£172.41	A1	

Question 13 A2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
13	$2.4 \times 1.5 \times 27.5$ or 99	M1	oe, the cost in pence
	£0.99	A1	M1 A0 for 99 or 99p: the answer must be in pounds

Question 14 A2 · Foundation · Grade 2 · 3 marks

Q	Answer	Mark	Comments
14(a)	$1.8 \times 23.7 + 32$ or $42.66 + 32$	M1	oe
	74.66	A1	
14(b)	7.88	B1	

Question 15 A2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
15	37.5×11.44 or 429	M1	oe
	£454.00	A1	accept £454

Question 16 A2 · Foundation · Grade 2 · 3 marks

Q	Answer	Mark	Comments
16(a)	3.4^2 or 11.56	M1	
	69.36	A1	
16(b)	39.304	B1	

Question 17 A2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
17	$95 \times 84 \div 60$ or 133	M1	oe
	£178	A1	accept £178.00

Question 18 A2 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
18	0.065×348 or 22.62	M1	oe
	29.38	A1	

Question 19 A2 · Foundation · Grade 3 · 2 marks

Q	Answer	Mark	Comments
19	$1.2 + 19.6 \times 3.4 - 4.9 \times 3.4^2$ or $1.2 + 66.64 - 56.644$	M1	oe, or 11.196
	11.2	A1	accept 11.2 or [11.19, 11.20]

Question 20 A2 · Foundation · Grade 3 · 4 marks

Q	Answer	Mark	Comments
20(a)	0.62×38 or 23.56	M1	oe
	£28.31	A1	
20(b)	$(20 - 4.75) \div 0.62$ or $15.25 \div 0.62$ or 24.5...	M1	oe, or $4.75 + 0.62 \times 24 = 19.63$ and $4.75 + 0.62 \times 25 = 20.25$
	24	A1	not 25

Question 21 A2 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
21	$42 \times 2.35 + 25$ or $98.7 + 25$	M1	oe
	$123.7 - 120$ or $123.7 \div 60 = 2.06...$	M1	their 123.7 changed to hours and minutes, or 124 minutes
	2 hours 4 minutes	A1	

Question 22 A2 A17 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
22	$7.59 - 1.15$ or 6.44	M1	oe
	their $6.44 \div 0.23$	M1	oe
	28	A1	or by correct trials, such as $1.15 + 0.23 \times 30 = 8.05$, leading to 28

Question 23 A2 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
23(a)	42.2	B1	accept 42.2 or [42.18, 42.19]
23(b)	1.61×6.5 or 10.465, or $10 \div 1.61$ or 6.21...	M1	oe
	Leo with 10.465 km or 6.21 miles	A1	

Question 24 A21 A5 A2 · Common · Grade 3 · 4 marks

Q	Answer	Mark	Comments
24(a)	$C = 4.79x + 6.35y$	B2	oe. B1 for $4.79x + 6.35y$ with no $C =$, or for $C = 4.79x + ky$ or $C = kx + 6.35y$
24(b)	$4.79 \times 4 + 6.35 \times 5$ or $19.16 + 31.75$	M1	oe
	No and £50.91	A1	or No and short by £0.91

Question 25 A5 A2 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
25(a)	$r = \frac{C}{2\pi}$	B1	oe
25(b)	$47.1 \div (2 \times \pi)$ or $47.1 \div 6.28...$	M1	oe
	7.5	A1	accept 7.5 or [7.49, 7.50]

Question 26 A2 · Foundation · Grade 3 · 2 marks

Q	Answer	Mark	Comments
26	$\frac{2450 \times 3.2 \times 4}{100}$	M1	oe
	£313.60	A1	accept £313.6

Question 27 A2 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
27(a)	$32.50 \times 4 + 0.18 \times 386$ or $130 + 69.48$	M1	oe
	£199.48	A1	
27(b)	Company A	B1ft	ft their (a) compared with £215

Question 28 A2 A17 · Foundation · Grade 3 · 4 marks

Q	Answer	Mark	Comments
28(a)	$15 - 6.5 \times 3.8$ or $15 - 24.7$	M1	oe
	-9.7	A1	
28(b)	$0 = 15 - 6.5h$ or $15 \div 6.5$	M1	oe
	2.3	A1	accept 2.3 or [2.30, 2.31]

Question 29 A2 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
29	$4.5^2 + 2 \times 9.8 \times 12.6$	M1	oe, or 267.21
	$\sqrt{267.21}$	M1	the square root of their 267.21
	16.3	A1	accept 16.3 or [16.34, 16.35]

Question 30 A5 A2 · Foundation · Grade 6 · 5 marks

Q	Answer	Mark	Comments
30(a)	$2 \times \pi \times \sqrt{\frac{0.75}{9.8}}$	M1	oe
	1.74	A1	accept 1.74 or [1.738, 1.739]
30(b)	$\frac{T}{2\pi} = \sqrt{\frac{L}{9.8}}$	M1	oe, divides by 2π first
	$\frac{T^2}{4\pi^2} = \frac{L}{9.8}$	M1	oe, squares both sides correctly
	$L = \frac{9.8T^2}{4\pi^2}$	A1	oe, such as $L = 9.8(\frac{T}{2\pi})^2$