

Mark scheme for 1MA1 Higher themed papers: Ratio and Proportion

GCSE Mathematics (1MA1)

Themed papers – Ratio and Proportion

Compiled from student-friendly mark schemes

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme

M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.

P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question.

A1 – accuracy mark. This mark is generally given for a correct answer following correct working.

B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.

C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working.

Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Question 1 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For 15 biscuits: Flour needed = $3 \times 50 \text{ g} = 150 \text{ g}$	P1	This mark is given for a process to find the amount of flour needed for 15 biscuits
	For 60 biscuits: $\frac{60}{15} \times 150$	P1	This mark is given for a process to find the amount of flour needed for 60 biscuits
	600	A1	This mark is given for the correct answer only
(b)	For 15 biscuits: Butter needed = $2 \times 50 \text{ g} = 100 \text{ g}$ For 60 biscuits: $\frac{60}{15} \times 100 = 400$	P1	This mark is given for a process to find the amount of butter needed for 60 biscuits
	$\frac{400}{250} = 1.6$, so 2 packets needed	A1	This mark is given for the correct answer only

Question 2 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$420 \times \frac{2}{7} = 120$	P1	This mark is given for a process to find the number of vanilla cakes
	$420 \times \frac{35}{100} = 147$	P1	This mark is given for a process to find the number of banana cakes
	$420 - 120 - 147 = 153$	P1	This mark is given for a full process to find the total number of lemon cakes and chocolate cakes
	$(153 \div 9) = 17$ $17 \times 4 =$	P1	This mark is given for a process to find the number of lemon cakes
	68	A1	This mark is given for the correct answer only

Question 3 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Chloe and Denesh each receive 1.5×2	P1	This mark is given for a process to find out the proportion that Chloe and Denesh each share
	$A : B : C : D = 2 : 7 : 3 : 3$	P1	This mark is given for a process to find the ratio of money that each person shares
	$\frac{7}{2+7+3+3} \times 360 = \frac{7}{15} \times 360$	P1	This mark is given for a process to find the amount of money that Ben gets
	168	A1	This mark is given for the correct answer only

Question 4 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Number of flats = $50 \div 5 \times 8 = 80$	P1	This mark is given for a process to find the number of flats in the village
	Number of houses = $80 \div 4 \times 7$	P1	This mark is given for a process to find the number of houses in the village
	140	A1	This mark is given for the correct answer only

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Number of women in the choir: $60 \div 2 = 30$ Number of men in the choir: $30 \div 3 = 10$	P1	This mark is given for a process to find out the number of men in the choir
	Number of children in the choir: $60 - 30 - 10 = 20$	P1	This mark is given for a process to find out the number of children in the choir
	$20 : 10$	P1	This mark is given for a process to find out the ratio of the number of children in the choir to the number of men in the choir
	$= 2 : 1$ so $n = 2$	A1	This mark is given for the correct answer only

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{240}{(3+7)} \times 3 = 72$	P1	This mark is given for a process to find out how many stamps Tom originally had
	$\frac{240}{(3+5)} \times 3 = 90$	P1	This mark is given for a process to find out how many stamps Tom had after buying some from Adam
	$90 - 72$	P1	This mark is given for a process to find how many stamps Tom bought from Adam
	18	A1	This mark is given for the correct answer only

Question 7 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$117 \times 4 = 468$	P1	This mark is given for a process to work out the total number of children in the theatre
	$468 \times 5 \div 2 = 1170$	P1	This mark is given for a process to work out total number of adults in the theatre
	$468 + 1170 = 1638$	A1	This mark is given for a correct answer for the number of people in the theatre
	$\frac{1638}{2600} \times 100 = 63$	P1	This mark is given for a process to work out the percentage of theatre seats being used
	Yes, there were people on 63% of the seats	C1	This mark is given for a correct conclusion supported by correct working

Question 8 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2 \times 7 : 5 \times 3 : 6 \times 4$ $14 : 15 : 24$	P1	This mark is given for a process to find the ratio of the number of pens of each colour sold
	$212 \div (14 + 15 + 24)$	P1	This mark is given for a process to find the proportion of green pens sold
	$\frac{212}{53} \times 24$	P1	This mark is given for a process to find the number of green pens sold
	96	A1	This mark is given for the correct answer only

Question 9 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	20 litres of yellow paint and 30 litres of blue paint	P1	This mark is given for the a process to find the overall ratio of litres
	$(20 \div 5) = 4$ tins of yellow paint needed $(30 \div 10) = 3$ tins of blue paint needed $\text{Cost} = (4 \times 26) + (3 \times 48)$ $= 104 + 144 = 248$	P1	This mark is given for a process to find the total cost of making 50 litres of green paint
	50 litres of green paint costs £248 10 litres of green paint costs £49.60	A1	This mark is given for finding out the cost of making 10 litres of green paint
	$\frac{66.96 - 49.60}{49.60} = 0.35$	P1	This mark is given for a process to find Robert's percentage profit
	35%	A1	This mark is given for the correct answer only

Question 10 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x, x + 7, 2x + 14$	1	This mark is given for representing the ages algebraically
	$x + x + 7 + 2x + 14 = 77$ $4x + 21 = 77$	1	This mark is given for a sum of the three expressions
	$x = 14$	1	This mark is given for finding a value of x as the age of Jay
	14 : 21 : 42	1	This mark is given for the answer shown or an equivalent ratio (e.g. 2 : 3 : 6)

Question 11 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$\pi \times r^2 \times 25 = 225\pi$	P1	This mark is given for a process to find the volume of the container C
	Vol of Liquid A: $225\pi \times \frac{2}{(2+13)}$ $= 30\pi$ Vol of Liquid B: $225\pi \times \frac{13}{(2+13)}$ $= 195\pi$	P1	This mark is given for a process to find the volume of Liquid A and the volume of Liquid B
	Mass of Liquid A: $30\pi \times 1.21 = 114.04$ Mass of Liquid B: $195\pi \times 1.02 = 624.86$	P1	This mark is given for a process to find the combined mass of Liquid A and Liquid B
	$114.04 + 624.86 = 739$ (3 sf)	A1	This mark is given for a correct answer to 3 significant figures

Question 12 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{x^2}{3x+5} = \frac{1}{2}$	P1	This mark is given for a process to form an equation
	$2x^2 = 3x + 5$ $2x^2 - 3x - 5 = 0$	P1	This mark is given for a process to write a quadratic equation to be solved
	$(2x - 5)(x + 1) = 0$	P1	This mark is given for a process to factorise the quadratic equation
	$x = 2.5, x = -1$	A1	This mark is given for the correct answers only

Question 13 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{3}{3+7} \times \frac{4}{4+5} = \frac{3}{10} \times \frac{4}{9} = \frac{12}{90}$ $= \frac{2}{15}$	P1	This mark is given for a process to find the proportion of shapes which are white circles
	$\frac{7}{3+7} \times \frac{2}{2+5} = \frac{7}{10} \times \frac{2}{7} = \frac{2}{10}$ $= \frac{1}{5}$	P1	This mark is given for a process to find the proportion of shapes which are black circles
	$\frac{2}{15} + \frac{1}{5}$	P1	This mark is given for a process to find the proportion of all shapes which are circles
	$\frac{1}{3}$	A1	This mark is given for the correct answer only

Question 14 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$1 + 5 = 6$ and $7 + 11 = 18$ and $6 \times 3 = 18$	P1	This mark is given for a process to start to solve the problem using multipliers
	$(7 + 11) \div (1 + 5) = 3$ and $1 \times 3 : 7 - (3 \times 1) : 11$	P1	This mark is given for a complete process to find ratios
	$3 : 4 : 11$	A1	This mark is given for the correct answer only

Question 15 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$120 \div \frac{3}{5} = 120 \times \frac{5}{3}$	M1	This mark is given for a method to find a solution
	200	A1	This mark is given for the correct answer only
(b)	Each tap fills the pool at the same rate Rate of filling does not change over time	C1	This mark is given for a correct explanation

Question 16 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	The lowest common multiple (LCM) of $(4 + 7)$ and $(3 + 5)$ is 88	C1	This mark is given for a correct explanation
(b)	Small cubes = $\frac{88}{11} \times 4 = 32$ Large cubes = $\frac{88}{11} \times 7 = 56$	P1	This mark is given for a process to find the number of small cubes and the number of large cubes
	Red cubes = $\frac{88}{8} \times 3 = 33$ Yellow cubes = $\frac{88}{8} \times 5 = 55$	P1	This mark is given for a process to find the number of red cubes and the number of yellow cubes
	All small cubes are yellow, so the least number of large yellow cubes = $55 - 32$ = 23	A1	This mark is given for the correct answer only

Question 17 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\text{Fraction choosing soup} = \frac{2}{2+3}$ $= \frac{2}{5}$ $\text{Fraction choosing prawns} = \frac{3}{2+3}$ $= \frac{3}{5}$	P1	This mark is given for a process to find the proportion of people who chose soup or prawns as a starter
	$\text{Soup and curry} = \frac{2}{5} \times \frac{3}{5+3}$ $\text{Prawns and curry} = \frac{3}{5} \times \frac{5}{5+1}$	P1	This mark is for a process to find out the proportion of people who chose soup and curry and the proportion of people who chose prawns and curry
	$\frac{6}{40} + \frac{15}{30}$	P1	This mark is given for a full process to find the fraction of people who chose curry
	$\frac{13}{20}$	A1	This mark is given for a correct answer only (or an equivalent fraction)

Question 18 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Ratio of blue pens : green pens : red pens is 8 : 20 : 5	1	This mark is given for a method to find ratios of the three colours of pens
	$\frac{5}{33}$ pens are red; greatest number of pens = 99	1	This mark is given for finding the fraction of red pens
	15	1	This mark is given for the correct answer only

Question 19 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{p-5}{q-5} = \frac{5}{1} ; \quad \frac{p+20}{q+20} = \frac{5}{2}$	P1	This mark is given for a process to represent the ratios given
	$p-5 = 5(q-5) ; \quad 2(p+20) = 5(q+20)$	P1	This mark is given for a method to find two simultaneous equations in p and q
	$5q - p = 20$ $5q - 2p = -60$ $p = 80$	M1	This mark is given for a method to rearrange to find a value for p
	$5q = 100$ $q = 20$	M1	This mark is given for a method to find a value for q
	$p : q = 80 : 20$ $= 4 : 1$	A1	This mark is given for the correct answer only

Question 20 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(y+x) = k(y-x)$	1	This mark is given for setting up an equations from the information given
	$ky - y = x + kx$	1	This mark is given for isolating x and y on opposite sides
	$y(k-1) = k(x+1) \quad \text{so} \quad y = \frac{k(x+1)}{k-1}$	1	This mark is given for using correct algebra to reach a conclusion

Question 21 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$5a = 8b = 6c$ or two ratios with common value for b $24 : 15$ and $15 : 20$	P1	This mark is given for a process to form an equation linking 3 variables
	e.g. $48 : 30 : 40$	P1	This mark is given for a process to find an unsimplified ratio
	$24 : 15 : 20$	A1	This mark is given for the correct answer only

Question 22 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$8600 \div 15$	P1	This mark is given for process to use density and mass
	1 m ³ of A has mass $8600 \div 15 \times 13$ (= 573.33)	P1	This mark is given for process to use ratio to find the density of A
	5 m ³ of A has mass 573.33×5 (= 37266.67)	P1	This mark is given for a full process to find mass of alloy A
	3 m ³ of C has mass $3 \times \frac{21}{15} \times 8600$ (= 36120)	P1	This mark is given for a full process to find mass of alloy C
	$37266.67 - 36120 = 1146.67$	A1	This mark is given for the correct answer in the range 1146 – 1150

Question 23 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\sqrt{(9 \times 7)} + \sqrt{(9c)}$	M1	This mark is given for a valid first step
	$3(\sqrt{7} + \sqrt{c})$	M1	This mark is given for a complete method to show a multiplicative relationship
	1:3	A1	This mark is given for the correct answer only

Question 24 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{3}{7}$ and $\frac{6}{11}$	P1	This mark is given for starting the process by converting the ratios into fractions
	$\frac{3}{7} \times \frac{6}{11}$	P1	This mark is given for a complete process to multiply the fraction
	$\frac{18}{77}$	A1	This mark is given for a correct answer or a correct equivalent

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Performance data:

Q	Taken from			Total Marks available	TOPIC	Spec Ref	AO	% Mean marks	Edexcel mean averages Marks of candidates who achieved grade:										
	Q	Series	Paper						ALL	9	8	7	6	5	4	3	2	1	U
1a	2a	June 2019	1H	3	Ratio	N2, R10	3	96	2.88	2.98	2.96	2.94	2.91	2.86	2.74	2.47	-	-	2.06
1b	2b	June 2019	1H	2	Ratio	R10	3	90	1.80	1.94	1.90	1.86	1.82	1.78	1.65	1.40	-	-	1.06
2	4	June 2017	3H	5	Number	N8, N12, R5	3	89	4.44	4.96	4.85	4.73	4.59	4.38	3.83	2.66	-	-	1.26
3	7	June 2019	2H	4	Ratio	R5, R7	1	79	3.16	3.89	3.75	3.55	3.31	2.93	2.15	1.12	-	-	0.51
4	2	June 2018	1H	3	Ratio	R6,	3	78	2.34	2.95	2.85	2.70	2.47	2.18	1.71	1.07	-	-	0.51
5	2	Nov 2019	1H	4	Ratio	N12, R4, R6	3	76	3.02	3.89	3.81	3.71	3.55	3.23	2.95	2.48	-	-	2.12
6	3	Nov 2019	2H	4	Ratio	R4, R5	3	74	2.95	4.00	4.00	3.81	3.61	3.39	2.84	2.25	-	-	1.38
7	2	June 2017	2H	5	Ratio	R3, R5, R8, R9	3	66	3.32	4.76	4.33	3.82	3.43	2.94	2.18	1.09	-	-	0.44
8	6	June 2019	1H	4	Ratio	R3R5	3	59	2.35	3.84	3.42	2.83	2.35	1.79	1.12	0.61	-	-	0.43
9	10	Nov 2018	2H	5	Ratio	R5, R9, R10	3	40	2.02	4.20	3.94	3.53	3.39	2.76	1.83	0.93	-	-	0.37
10	2	Nov 2017	1H	4	Ratio	R4, A21	3	38	1.51	4.00	3.53	3.16	2.89	2.25	1.64	1.11			0.48
11	13	Nov 2019	3H	4	Ratio	R5, R11, G16	3	25	1.00	4.00	3.11	2.61	1.91	1.14	0.59	0.24	-	-	0.09
12	17	June 2019	1H	4	Algebra	R6, R8, A18	3	23	0.92	3.64	2.50	1.16	0.38	0.12	0.04	0.02	-	-	0.02
13	14	June 2017	1H	4	Ratio	R810	1	21	0.84	3.03	1.86	1.05	0.57	0.29	0.12	0.06	-	-	0.02
14	12	June 2017	3H	3	Ratio	R6	3	22	0.65	2.36	1.49	0.85	0.46	0.19	0.06	0.02	-	-	0.01
15a	4a	Nov 2018	1H	2	Ratio	R10	1	20	0.39	1.80	1.58	1.01	0.76	0.50	0.28	0.12	-	-	0.10

15b	4b	Nov 2018	1H	1	Ratio	R10	3	36	0.36	0.70	0.82	0.72	0.66	0.51	0.30	0.14	-	-	0.13
16a	17a	June 2019	2H	1	Ratio	R5, R7	2	19	0.19	0.59	0.36	0.22	0.14	0.08	0.04	0.02	-	-	0.00
16b	17b	June 2019	2H	3	Ratio	R5, R7	1	40	1.20	2.44	1.88	1.41	1.10	0.83	0.53	0.25	-	-	0.15
17	14	Nov 2019	3H	4	Ratio	R5, R8	3	20	0.81	3.56	3.22	2.47	1.75	0.93	0.31	0.13	-	-	0.06
18	4	Nov 2017	3H	3	Ratio	R5	3	13	0.38	2.88	2.47	2.12	1.49	0.79	0.21	0.07			0.03
19	17	Nov 2018	2H	5	Algebra	A1, A21, R4-6, R8	3	10	0.48	4.30	3.18	1.56	0.77	0.56	0.28	0.16	-	-	0.07
20	14	Nov 2017	1H	3	Ratio	R4 R8 A5	2	2	0.06	2.25	1.59	0.51	0.22	0.05	0.02	0.01			0
21	8	Mock Set 1	2H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	9	Mock Set 2	3H	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	14	Mock Set 2	3H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	14	Mock Set 4	2H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				94					37.07	72.96	63.4	52.33	44.53	36.48	27.42	18.43	-	-	11.3