

SOLUTIONS

GCSE Maths: Ratio and Proportion

Mark schemes for the Grade 4 starter questions

Questions	20
Total marks	83
Sub-topics covered	10
Papers drawn from	20
Years	2017 to 2024

The official Edexcel mark scheme for every question in the Ratio and Proportion question booklet, in the same order.

Question numbers match: Question 7 here answers Question 7 there.

M marks are for method, A marks for accuracy, B marks stand alone.
'oe' means or equivalent; 'cao' means correct answer only.

R1 Converting Between Units

Question 1

November 2017 · Paper 3 · Q2

3 marks

2		New York (supported)	P1	for changing between £ and \$, eg $1.089 \times 1.46 (= 1.58(9.))$ or $2.83 \div 1.46 (= 1.93(8.))$ or between litres and gallons, eg $1.089 \times 3.785 (= 4.12(1.))$ or $2.83 \div 3.785 (= 0.74(7.))$
			P1	for a complete process to give values that can be used for comparison, eg " $1.938...$ " $\div 3.785 (= 0.51(2.))$ or " $1.589...$ " $\times 3.785 (= 6.01(7.))$ or $1.089 \times 3.785 (= 4.12(1.))$ and $2.83 \div 1.46 (= 1.93(8.))$
			C1	for New York and correct comparative values

Question 2

June 2022 · Paper 2 · Q7

4 marks

7	No (supported)	P1	for a conversion with litres and gallons, eg $18 \div 4.5 (= 4)$ or $8 \times 4.5 (= 36)$	See page at end of mark scheme
		P1	for a conversion with £ and euros, eg $27 \times 0.85 (= 22.95)$ or $40.8 \div 0.85 (= 48)$	
		P1	for finding the unit price, eg $27 \div 18 (= 1.5)$ OR finding proportionality for fuel eg (" 36 " $\div 18$) $(= 2)$	May compare cost per gallon or cost in euros May be seen in a calculation or given in a description
		C1	for No with comparative figures, eg No with 20.4 and 22.95 OR No with 1.275 and 1.133...	Accept comparative figures rounded or truncated No is implied by eg Wales is cheaper

R2 Scale Factors, Diagrams and Maps

Question 3

June 2024 · Paper 2 · Q8

3 marks

8	35	P1	for one correct use of the given scale, eg $40 \div 5 (= 8)$ or $28 \times 5^2 (= 700)$	Can award these marks in either order
		P1	for process to use area of triangle, eg $28 = \frac{1}{2} \times PQ \times [QR]$ or $[area] = \frac{1}{2} \times PQ \times 40$	[QR] must be clearly identified as the drawing length, and cannot be 40 [area] must be clearly identified as the real area, and cannot be 28
		A1	cao	

R4 Ratio Notation

Question 4

November 2019 · Paper 1 · Q2

4 marks

2	2 (supported)	P1	for a process to find the number of men, eg. $(60 \div 2) \div 3 (= 10)$	
		P1	for a process to find the number of children, eg. $60 - "30" - "10" (= 20)$	$60 \div 3 = 20$ scores no marks
		P1	for a start of a process to find the value of n , eg. $("20" : "10") \div 5$ or $20 : 10 = 10 : 5$ or $"20" \div "10"$	Any ratio must come from correct processes to find the number of children and the number of men
		A1	for 2 with supportive working	Award 0 marks for 2 with no correct supportive working Award full marks for 2 : 1 given as a final answer from correct supportive working

R5 Dividing Quantities in a Given Ratio

Question 5

June 2017 · Paper 3 · Q4

5 marks

4		68	P1	for a process to find the number of vanilla cakes, eg $420 \times 2 \div 7$ oe (= 120)
			P1	for a process to find the number of banana cakes, eg 420×0.35 oe (= 147)
			P1	(dep P1) for a full process to find the number of lemon/chocolate cakes eg $420 - (\text{vanilla cakes}) - (\text{banana cakes})$ (= 153)
			P1	(dep on previous P1) for a process to find the number of lemon cakes eg " $153 \div 9 \times 4$ oe (= 68)
			A1	cao
			OR	
			P1	for writing two proportions in the same format
			P1	for combining the proportions of vanilla and banana cakes eg $2/7 + 7/20$ (= 89/140)
			P1	(dep P1) for a full process to find the proportion or number of lemon/chocolate cakes eg $1 - "89/140"$ (= 51/140)
			P1	(dep on previous P1) for a process to find the number of lemon cakes eg " $51/140 \times 420 \div 9 \times 4$ (= 68)
			A1	cao

Question 6

November 2020 · Paper 2 · Q3

5 marks

3	No	P1	for $3000 \div (2 + 3)$ (= 600)	
	(supported)	P1	for " 600×2 (= 1200) or " 600×3 (= 1800) or " $600 \div 6$ (= 100) or " $600 \div 20$ (= 30)	
		P1	for " $1200 \div 6$ (= 200) or " $1800 \div 20$ (= 90) or " 100×2 (= 200) or " 30×3 (= 90)	
		P1	for " $90 \div ("200" + "90") \times 100$ (= 31.0...) oe or " $90 \div ("200" + "90")$ (= 0.31...) or $0.3 \times ("200" + "90")$ (= 87)oe	Full method to compare
		C1	correct conclusion and fully correct calculations with accurate figure eg No and 87 or No and 31% or No and 0.31	No working, answer only no marks No may be implied by a statement

Question 7

June 2022 · Paper 1 · Q3

5 marks

3	30	P1	for $160 \div (3+7)$ (= 16) or $\frac{3}{3+7}$ (= $\frac{3}{10}$)	
		P1	for " 16×3 (= 48) or " $\frac{3}{10} \times 160$ (= 48)	
		P1	for a correct step using 48 eg " $48 \div 8$ (= 6) or " $48 \times 25 \div 100$ (= 12) or (indep) for combining $\frac{1}{8}$ and 25%, eg $\frac{1}{8} + \frac{1}{4}$ (= $\frac{3}{8}$) or " $0.125 + "0.25"$ (= 0.375) or " $12.5\% + 25\%$ (= 37.5(%))	
		P1	for a complete process to find the number of petrol cars, eg " $48 - "6" - "12"$ oe or $(1 - \frac{3}{8}) \times "48"$ oe or " $\frac{3}{10} \times (1 - \frac{3}{8}) \times 160$ oe	
		A1	cao	Award no marks for a correct answer with no supportive working
			SC B2 for an answer of 100 if P0 scored	

R7 Proportion as Equality of Ratios

Question 8

November 2022 · Paper 1 · Q5

2 marks

5	7500	M1	for method to find expected number of model B, eg $\frac{15}{80} \times 40000$ oe or $\frac{15}{23+15+30+12} \times 40000$ oe	
		A1	cao	

Question 9

November 2020 · Paper 3 · Q4

5 marks

4	(a)	Yes (supported)	P1	for start of process, eg $5 \times 9 (= 45)$ or $10 \times 14 (= 140)$ or $5 \times 2 (= 10 \text{ (kg)})$ or $3 \div 2 (= 1.5 \text{ (boxes)})$	Accept values rounded or truncated to 1dp in both (a) and (b). Ignore units
			P1	for process using ratio of areas, eg $"140" \div "45" (= 3.1...)$ or for using ratio of amount of seed eg $"10" \div 3 (= 3.3...)$ or for finding coverage for 1 kg of grass seed, eg $"45" \div 3 (= 15 \text{ (m}^2\text{)})$	
			P1	for process to find amount of seed needed, eg $"140" \div "45" \times 3 (= 9.3... \text{ kg})$ or $"140" \div "45" \times "1.5" (= 4.6... \text{ (boxes)})$ oe or $"15" \times 2 (= 30 \text{ (m}^2 \text{ per box)})$ and $"140" \div "30" (= 4.6... \text{ (boxes)})$ or for process to find area that can be seeded, eg $"10" \div 3 \times "45" (= 150 \text{ (m}^2\text{)})$ or $"140" \div "10" (= 14 \text{ (m}^2\text{)})$ oe	Accept 9.4 Accept 4.7
			C1	for "Yes" supported by correct figures eg 4.6...(and 5), or 9.3...and 10 or 150 and 140 (or 140 to 148.5) or 15 and 14	
	(b)	Yes, (does not have enough) (supported)	C1	for reasoning supported with correct figures, eg does not have enough seed and compares 9 (kg) with 9.3...(kg) or 4.5 (boxes) with 4.6... (boxes) or 135 (m ²) with 140 (m ²) ft from (a)	Values used in (a) do not need repeating in (b) as long as intention is clear

R9 Percentages and Percentage Change

Question 10

June 2018 · Paper 2 · Q4

5 marks

4	3 : 5	P1	for process to find 20% or 120% of the cost, eg $8500 \times 0.2 (= 1700)$ oe or $8500 \times 1.2 (= 10200)$ oe	When partitioning all figures quoted must be correct or a full method shown eg $10\% = 8500 \div 10 (= 850)$ and $20\% =$ $"850" + "850" (= 1700)$
		P1	for process to find total cost of payments, eg $12 \times 531.25 (= 6375)$	
		P1	for complete process to find value of deposit, eg $"10200" - "6375" (= 3825)$ or $8500 - "6375" (= 2125)$ and $"2125" + "1700" (= 3825)$ OR the deposit as a proportion of the total cost, eg $1 - \frac{"6375"}{"10200"} (= \frac{3}{8})$	May be seen as a fraction of the total eg $\frac{3825}{10200} (= \frac{3}{8})$
		P1	for finding a correct un-simplified ratio, eg $"3825" : "6375"$ oe or $5:3$ or $1.6 : 1$ or $\frac{5}{3} : 1$	Figures at this stage must be expressed as part of a ratio eg $51:85$, $\frac{3}{8} : \frac{5}{8}$
		A1	Accept 1: 1.6, 1: $\frac{5}{3}$	Ignore consistent units

Question 11

November 2018 · Paper 1 · Q3

5 marks

3	No (supported)	P1	for start to process, eg. $2100 \times \frac{40}{100}$ (= 840) or $100 - 40$ (= 60)	May compare bonus shares of a single salesman or total bonus share for all 7 salesmen.
		P1	for process to find the 7 salesmen's share of bonus, eg $2100 - "840"$ (= 1260) or $2100 \times \frac{60}{100}$ (= 1260)	
		P1	for process to find bonus amount each salesman gets eg $"1260" \div 7$ (= 180) OR process to find the total bonus for all salesmen if shared equally, eg $\frac{2100}{10} \times 7$ (= 1470)	
		P1	for process to compare what a single salesman gets under each scheme, eg $"180" \times \frac{25}{100}$ (= 45) and $\frac{2100}{10} - "180"$ (= 30) or $"180" \times \frac{25}{100}$ (= 45) and $"180" + "45"$ (= 225) oe and $\frac{2100}{10}$ (= 210) or $(\frac{2100}{10} - "180") \div "180" \times 100$ (= 16.6...) OR process to compare what all salesmen gets under each scheme, eg $"1260" \times \frac{25}{100}$ (= 315) and $"1470" - "1260"$ (= 210) or $"1260" \times \frac{25}{100}$ (= 315) and $"1260" + "315"$ (= 1575) oe and $"1470"$ or $(\frac{2100}{10} - "1260") \div "1260" \times 100$ (= 16.6...)	
		A1	'No' supported by correct figures, eg 45 and 30, 225 and 210, 315 and 210 or 1575 and 1470 or 16.6...(% and 25%)	Do not award unless correct figures have been shown to support a statement made that the salesman was not correct.

Question 12

November 2024 · Paper 3 · Q5

5 marks

5	45.6	P1	for a process to start to work with the ratio, eg $240 \div (3 + 5)$ (= 30) or pens = $3n$ and pencils = $5n$ where n is a positive integer	Can work in £ or pence but must be consistent, 90 or 150 imply P1 This mark can be awarded at any stage
		P1	for a complete process to find the number of pens and pencils, eg $"30" \times 3$ (= 90) and $"30" \times 5$ (= 150) OR for process to find one cost or amount to sell for one item eg [pens] $\times 9$ (= 810) or [pens] $\times 11$ (= 990) or [pencils] $\times 6$ (= 900) or [pencils] $\times 10$ (= 1500) OR process to find the profit for one pen or one pencil eg $11 - 9$ (= 2) or $10 - 6$ (= 4)	[pens] could be $"30" \times 3$ or their number of pens [pencils] could be $"30" \times 5$ or their number of pencils [pens] , [pencils] $\neq 1$
		P1	for a process to find the total cost to buy or the total amount to sell for both, eg [pens] $\times 9$ + [pencils] $\times 6$ (=1710) or [pens] $\times 11$ + [pencils] $\times 10$ (= 2490) OR process to find the profit for one item eg [pens] $\times 11$ - [pens] $\times 9$ (= 180) or [pens] $\times (11 - 9)$ (= 180) or [pencils] $\times 10$ - [pencils] $\times 6$ (= 600) or [pencils] $\times (10 - 6)$ (= 600)	180 or 600 or 780 implies P3 [pens] could be $"30" \times 3$ or their number of pens [pencils] could be $"30" \times 5$ or their number of pencils [pens] , [pencils] $\neq 1$
		P1	for a complete process to find the profit as a percentage or a decimal, eg $\frac{[2490] - [1710]}{[1710]} \times 100$ or $\frac{[2490] - [1710]}{[1710]}$ (= 0.456...) or for a process to find the amount to sell as a percentage of the cost eg $\frac{[2490]}{[1710]} \times 100$ (= 145.6...)	[2490] is their amount to sell for both pens and pencils [1710] is their cost of pens and pencils [2490] - [1710] may be [180] + [600]
		A1	answer in the range 45.6 to 45.62	If an answer is given in the range in working and then rounded incorrectly award full marks. A correct answer with no supportive working gets 0 marks

R10 Direct and Inverse Proportion

Question 13

June 2023 · Paper 3 · Q4

2 marks

4	17.5	P1	for a first step, eg $5 \times 14 (= 70)$ or $14 \div 4 (= 3.5)$ or $5 \div 4 (= 1.25)$ or $4 \div 5 (= 0.8)$	Could be done algebraically. 11.2 as answer scores no marks.
		A1	oe	

Question 14

November 2018 · Paper 3 · Q5

4 marks

5	(a)	2 mins 48 secs	P1	for an appropriate first step eg $700 \div 475 (=1.47..)$ or $475 \div [\text{time}] (= 4.16.. \text{ m/s})$ or $[\text{time}] \div 475 (= 0.24 \text{ s/m})$	[time] what candidate indicates as time of first race Units are not needed and can be ignored if given
			P1	for a complete method to find the required time eg $700 \div 475 \times [\text{time}] (=168)$ or $700 \div (475 \div [\text{time}]) (=168)$ or $[\text{time}] \div 475 \times 700 (=168)$	Allow calculation in stages and appropriate rounding.
			A1	cao	
	(b)	Statement	C1	eg takes less time Acceptable examples Quicker time Faster time Reduces my answer to part (a) Not acceptable examples It is an underestimate The amount of time could/may increase Laura goes faster	

R11 Compound Units

Question 15

November 2019 · Paper 3 · Q6

4 marks

6	50	B1	for finding the time difference, eg, 1hr 18 mins or 78 mins oe	Allow 1.18 for this mark 118 scores B0
		P1	for correct process to convert minutes to hours, eg $18 \div 60 (=0.3)$ or $78 \div 60 (=1.3)$ or for a correct process to convert speed in miles per minute to mph eg " $0.833..$ " $\times 60$	For a conversion of time or speed
		P1	for using speed = distance $\div$ time eg, $65 \div [\text{time}]$ or $65 \div 78 (=0.833..)$	[time] is what the candidate clearly indicates as time difference
		A1	cao SCB2 for $83(.333...)$ seen as the answer	

Question 16

November 2021 · Paper 3 · Q4

4 marks

4	260	P1	conversion to common units of capacity eg $2.2 \times 4.54 (= 9.988)$ or $8 \div 4.54 (= 1.76...)$ OR for Company A $2400 \div 4.54 (= 528.63...)$ OR $2400 \div 8 (= 300)$ OR a rate per minute $8 \div [\text{time for Company A}] (= 4.8...) \text{ oe}$	Results of calculations may be truncated or rounded. [time for Company A] could be 1 min 40 sec or 1.66... or 1.6 or 1.40 etc as long as it is clear it relates to 1 min 40 sec
		P1	for a complete process to find the time for company A or company B in minutes. eg in litres Company A $2400 \div "4.8..." (= 500)$ or $"300" \times [1 \text{ min } 40 \text{ sec}] (= 500)$ or Company B $2400 \div "9.988" (= 240.28...)$ OR eg in gallons Company A $"528.63.." \div ("1.76.." \div [1 \text{ min } 40 \text{ sec}]) (= 500)$ or Company B $"528.63..." \div 2.2 (= 240.28...)$	
		P1	for complete processes to find the times for both company A and company B in minutes. Company A eg in litres $2400 \div "4.8..." (= 500)$ or $"300" \times [1 \text{ min } 40 \text{ sec}] (= 500)$ or in gallons $"528.63.." \div ("1.76.." \div [1 \text{ min } 40 \text{ sec}]) (= 500)$ AND Company B eg in litres $2400 \div "9.988" (= 240.28...)$ or in gallons $"528.63..." \div 2.2 (= 240.28...)$	
		A1	for an answer in the range 259 to 260	If the answer is given within the range but then rounded incorrectly award full marks.

Question 17

June 2017 · Paper 2 · Q4

5 marks

4 (a)	57.1	P1	for a process to find time from Liverpool to Manchester, eg. $56 \div 70 (= 0.8 \text{ (hrs) or } 48 \text{ (mins)})$
		P1	for a process to find total distance, eg. $56 + 61 (= 117)$ or the total time, eg. $"48" + 75 (= 123)$ or $"0.8" + \frac{75}{60} (= 2.05)$ with consistent units of time
		P1	(dep P2) for a correct process to find average speed with consistent units of time, eg. $"117" \div "2.05"$ or $"117" \div "123"$
		A1	for answer in the range 57 to 57.1
(b)	explanation	C1	for explaining that the time taken for the two parts of the journey must be the same or the distance from Leeds to York is $\frac{3}{4}$ of the distance from Barnsley to Leeds

R12 Ratios of Length, Area and Volume

Question 18

November 2022 · Paper 3 · Q5

4 marks

5 (a)	16	M1	for a ratio of $\frac{20}{5}$ or $\frac{5}{20}$ or 4 or 0.25 or $\frac{5}{4}$ or $\frac{4}{5}$ or 1.25 or 0.8 oe
		A1	cao
(b)	5.5	M1	for $22 \times "0.25"$ or $22 \div "4"$ oe
		A1	oe

R16 Growth, Decay and Iterative Processes

Question 19

June 2023 · Paper 2 · Q8

4 marks

8	Rachel supported	P1	for process to begin to work with percentage for year 1 for Tamsin or Rachel, eg $150000 \times 0.04 (= 6000)$ oe or $150000 \times 1.04 (= 156000)$ oe or $160000 \times 0.015 (= 2400)$ oe or $160000 \times 1.015 (= 162400)$ oe	May be implied by 12000 or 4800 or 162000 or 164800
		P1	for process to use compound interest for Tamsin or Rachel, eg “156000” $\times 0.04 (= 6240)$ oe or “156000” $\times 1.04 (= 162240)$ oe or “162400” $\times 0.015 (= 2436)$ oe or “162400” $\times 1.015 (= 164836)$ oe oe or $1.04^2 (= 1.0816)$ or $1.015^2 (= 1.030225)$ OR for process to begin to work with percentage increase for Tamsin and Rachel for one year, eg $150000 \times 1.04 (= 156000)$ oe and $160000 \times 1.015 (= 162400)$ oe	values may be rounded or truncated to 3 sf May be implied by 162000 and 164800
		P1	for full process to find figures to compare, eg Tamsin for 2 years and Rachel for 2 years eg $150000 \times 1.04^2 (= 162240)$ oe and $160000 \times 1.015^2 (= 164836)$ oe oe OR Tamsin for 2 years and Rachel for 1 year eg $150000 \times 1.04^2 (= 162240)$ oe and $160000 \times 1.015 (= 162400)$ oe	Other comparisons are possible
		C1	for Rachel with supporting figures, eg 162240 and 164836 or 162240 and 162400 or other valid conclusion with supporting comparable figures	Note that the figure used to compare for Rachel can be the figure after 2 years or after 1 year

Question 20

November 2018 · Paper 2 · Q4

5 marks

4	(a)	Ben (supported)	P1	shows how to work interest out for one year eg $2000 \times 0.025 (= 50)$ or $1600 \times 0.035 (= 56)$ or 150 or 168 or $2000 \times 1.025 (= 2050)$ or $1600 \times 1.035 (= 1656)$	Throughout accept figures ± 1 pence which do not need to be presented in money notation (to 2dp) or with monetary symbols. Award mark for a correct process shown, for which these figures can be taken as implying the process. As above, award mark for both correct processes shown for both accounts, which these figures can be taken as implying the process. Accept an answer of “shares”.
			P1	shows compound interest calculation for one account eg $2050 \rightarrow 51.25$ or $2101.25 \rightarrow 52.53$ or $1656 \rightarrow 57.96$ or $1713.96 \rightarrow 59.99$ eg $2000 \times 1.025^3 (= 2153.78)$ or $1600 \times 1.035^3 (= 1773.95)$	
			P1	shows complete compound interest calculation for both accounts eg $2000 \times 1.025^3 (= 2153.78)$ and $1600 \times 1.035^3 (= 1773.95)$ OR one interest stated correctly eg 153.78 or 173.95	
			C1	Ben (shares) supported by 153.78 and 173.95	

Question 20 · continued

4	(b)	conclusion	C1	conclusion (ft) eg no change, shares now 182.5... Acceptable examples no since shares/Ben now 182.5 Still Ben since $182.5 > \text{Ali}$ No; he only gets 8.57 more No; he gets 68.56 instead of 59.98 (3rd yr) No; Ben already gets more interest, he would just get even more Not acceptable examples no shares now 182.5 Still Ben since less than Ali $182.5 > 153.78$ no; he needs 20.17 more	Conclusion needs to be supported. ft is from part (a); calculations carried out as part of (b) need to be correct for the comparison to be valid.
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