5.1 Writing a Ratio as a Fraction or Linear Function: Test Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 70 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write the ratio 3:5 as a fraction in its simplest form.

(Total for Question 1 is 1 mark)

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2 Convert the ratio 2:7 into a fraction.

(Total for Question 2 is 1 mark)

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3 The ratio of boys to girls in a class is 5:8. What fraction of the class are girls?

(Total for Question 3 is 2 marks)

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4 The ratio of boys to girls in a class is 5:7. Write the number of boys as a fraction of the total number of pupils in the class.

(Total for Question 4 is 1 mark)

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5 A ratio is 15:20.

(a) Simplify the ratio fully. **(1)**

(b) Write the first part of your simplified ratio as a fraction of the total. **(1)**

(Total for Question 5 is 2 marks)

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6 y is directly proportional to x. When x = 6, y = 15.

(a) Write down the ratio x:y in its simplest form. **(2)**

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(b) Write y as a linear function of x. **(2)**

(c) Use your function to find the value of y when x = 9. **(1)**

.....

(Total for Question 6 is 5 marks)

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7 The ratio of sugar to flour to others is 7:9:7. What fraction of the total is others? Give your answer in its simplest form.

(Total for Question 7 is 2 marks)

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8 Sam's savings, S, and Priya's savings, P, are in the ratio S:P = 5:12.

(a) Write P as a fraction of S. **(1)**

(b) Write P as a linear function of S. **(2)**

(Total for Question 8 is 3 marks)

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9 Simplify the ratio 6x:15x fully (x is not zero), and hence write the first quantity as a fraction of the second quantity.

(Total for Question 9 is 2 marks)

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10 A mixture contains acid and water in the ratio a:(2a + 3). If the total volume is 120 ml, express the volume of acid as a function of a, then find the acid volume when a = 3.

(a) Express the volume of acid, V ml, as a function of a. **(2)**

(b) Find V when a = 3. Give your answer in ml, simplified. **(2)**

(Total for Question 10 is 4 marks)

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11 a and b are two quantities such that a:b = (x + 1):(2x), where x is a positive number. Express b/a in terms of x.

(Total for Question 11 is 2 marks)

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12 A printer uses ink such that the number of pages printed, P, and the volume of ink used, I ml, are in the ratio P:I = 40:3.

(a) Write I as a linear function of P, in the form I = kP. **(1)**

(b) Use your linear function to find the volume of ink used when 500 pages are printed. **(2)**

(Total for Question 12 is 3 marks)

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13 This question has two parts.

(a) Show that if two quantities are in the ratio (k + 2):(2k - 1) and their sum is S, then the first quantity equals S*(k+2)/(3k+1). **(3)**

(b) For k = 2 and S = 240 find the two quantities. **(3)**

(Total for Question 13 is 6 marks)

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14 The ratio of a to b is (x + 1):(2x - 1), where x > 1/2. Given that a is 2/5 of the total a + b, form and solve an equation to find the value of x.

(Total for Question 14 is 4 marks)

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15 Show that for positive x the expression $f(x) = (4x + 6)/(2x + 3)$ is equal to 2 for all x except where it is not defined. Then explain what this means in terms of the ratio $4x+6 : 2x+3$.

(a) Show that $f(x) = (4x + 6)/(2x + 3) = 2$ for all x where the expression is defined. **(6)**

(b) Explain what this implies about the ratio $4x+6 : 2x+3$ for all x where it is defined. **(4)**

(Total for Question 15 is 10 marks)

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16 Given that $q = 5/2\ p$, and that p and q are both positive integers less than 30, list all possible pairs of values (p, q) for which the ratio p:q simplifies to 2:5.

(Total for Question 16 is 3 marks)

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Mark scheme · 5.1 Writing a Ratio as a Fraction or Linear Function: Test Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

3/5 cao **B1**

Answer: 3/5

Question 2

2/7 cao **B1**

Answer: 2/7

Question 3

writes fraction as 8/(5+8) or equivalent **M1**

8/13 cao **A1**

Answer: 8/13

Question 4

5/12 oe **B1**

Answer: 5/12

Question 5

(a) 3:4 cao **B1**

(a) Answer: 3:4

(b) 3/7 oe ft from (a) **B1**

(b) Answer: 3/7

Question 6

(a) 6:15 seen **M1**

(a) 2:5 cao **A1**

(a) Answer: 2:5

(b) sets up y/x = 5/2 **M1**

(b) y = 2.5x oe (accept y = 5/2 x) **A1**

(b) Answer: y = 2.5x

(c) 22.5 ft from (b) **B1**

(c) Answer: 22.5

Question 7

total number of parts = 23 seen **M1**

7/23 cao **A1**

Answer: 7/23

Question 8

(a) 12/5 oe **B1**

(a) Answer: 12/5

(b) sets up P/S = 12/5 **M1**

(b) P = 12/5 S oe (accept P = 2.4S) **A1**

(b) Answer: P = 2.4S

Question 9

divides both parts by common factor 3x to get 2:5 **M1**

2/5 cao **A1**

Answer: 2/5

Question 10

(a) method: fraction acid = a/(a + (2a+3)) = a/(3a+3) **M1**

(a) V = 120 * a/(3a+3) or equivalent simplified form cao **A1**

(a) Answer:V(a) = 120 * a/(3a + 3).

Working check: total ratio = a + (2a+3) = 3a+3 so acid fraction = a/(3a+3).

(b) substitute a = 3 into V = 120 * a/(3a+3) to get 120 * 3/(9+3) **M1**

(b) 30 ml cao **A1**

(b) Answer:30 ml.

Working check: V = 120 * 3/12 = 120 * 1/4 = 30 ml.

Question 11

sets up b/a = 2x/(x + 1) **M1**

2x/(x + 1) cao, no further valid simplification **A1**

Answer: b/a = 2x/(x + 1)

Question 12

(a) I = 3/40 P oe (k = 3/40 or 0.075) **B1**

(a) Answer: I = 3/40 P

(b) 3/40 x 500, ft their k from (a) **M1**

(b) 37.5 ml cao **A1**

(b) Answer: 37.5 ml

Question 13

(a) write fraction first = (k+2)/((k+2)+(2k-1)) **M1**

(a) simplify denominator: (k+2)+(2k-1)=3k+1 **M1**

(a) conclude first = S*(k+2)/(3k+1) cao **A1**

(a) Answer:First = S*(k+2)/(3k+1).

Working check: sum of ratio parts = k+2 + 2k-1 = 3k+1 so fraction = (k+2)/(3k+1) and multiply by S.

(b) substitute k = 2 into formula: first = 240*(4)/(7) or equivalent **M1**

(b) calculate first = 960/7 and second = 240 - first or use ratio parts 4:3 to get integer values? note **M1**

(b) first = 960/7 and second = 240*(3)/(7) = 720/7 cao **A1**

(b) Answer:First = 960/7; second = 720/7.

Working check: ratio for k=2 is 4:3 so parts sum 7. First = 240 * 4/7 = 960/7, second = 240 * 3/7 = 720/7.

Question 14

a + b = (x + 1) + (2x - 1) = 3x **M1**

(x + 1)/(3x) = 2/5 formed **M1**

5(x + 1) = 6x leading to 5x + 5 = 6x, cso **M1**

x = 5 cao **A1**

Answer: x = 5

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Question 15

(a) attempt to divide numerator by denominator or factor: 4x+6 = 2(2x+3) **M1**

(a) write (4x+6)/(2x+3) = 2(2x+3)/(2x+3) **M1**

(a) cancel (2x+3) provided 2x+3 not zero **M1**

(a) conclude f(x) = 2 for all x with 2x+3 not equal to 0 **M1**

(a) state excluded value x = -3/2 **M1**

(a) complete proof f(x)=2 and domain note cao **A1**

(a) Answer:f(x) = 2 for all x except x = -3/2, where f is undefined.
Working check: 4x+6 = 2(2x+3) so f(x) = 2(2x+3)/(2x+3) = 2, provided 2x+3 not zero.

(b) state that ratio simplifies to 2:1 for all allowed x **M1**

(b) mention that both numerator and denominator scale by same factor so ratio constant **M1**

(b) note excluded x = -3/2 where denominator is zero **M1**

(b) clear statement: 4x+6 : 2x+3 = 2 : 1 for all x except x = -3/2 cao **A1**

(b) Answer:The ratio 4x+6 : 2x+3 is equivalent to 2 : 1 for every x where defined. It is constant because numerator = 2 times denominator; x = -3/2 is excluded since denominator is zero.
Working check: dividing both parts by (2x+3) gives 2:1.

Question 16

recognises p = 2n and q = 5n for some positive integer n **M1**

uses q < 30 to find n ≤ 5 (since 5n < 30), ft their expressions for p and q **M1**

all five pairs (2,5), (4,10), (6,15), (8,20), (10,25) listed, cao **A1**

Answer: (2,5), (4,10), (6,15), (8,20), (10,25)

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