2021 Assessment resources
GCSE Mathematics

Ratio – Higher

Answers and commentaries

The question numbers in this resource reflect the question numbers from the original papers and match the question numbers in the corresponding 2021 assessment materials.

Question 1

Please see the mark scheme.

Question 11

11 Ed and Fay shared £330 in the ratio 7 : 4

Ed gives Fay some of his money.

Fay now has the same amount as Ed.

How much does Ed give Fay?

[3 marks]

Answer £ _____

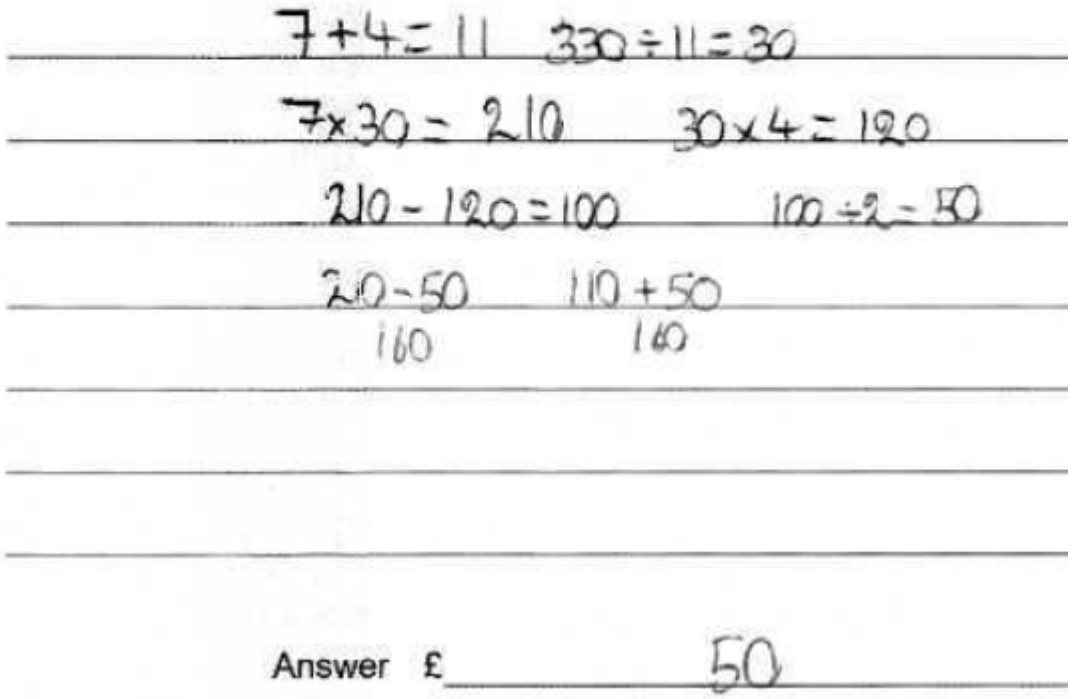
Student A

Ed and Fay shared £330 in the ratio 7 : 4

Ed gives Fay some of his money.

Fay now has the same amount as Ed.

How much does Ed give Fay?



Commentary

There are four alternative schemes for this question. All of them award the first mark for working out that one 'share' has a value of £30. The second mark in each scheme is then awarded for taking a significant step to working out the answer. In alternative method 1 that step is working out that Ed has £210 and Fay has £120, which this student has done. They have made an arithmetic error from there, writing that '210 – 120 = 100', which loses the final mark.

2 marks

Student B

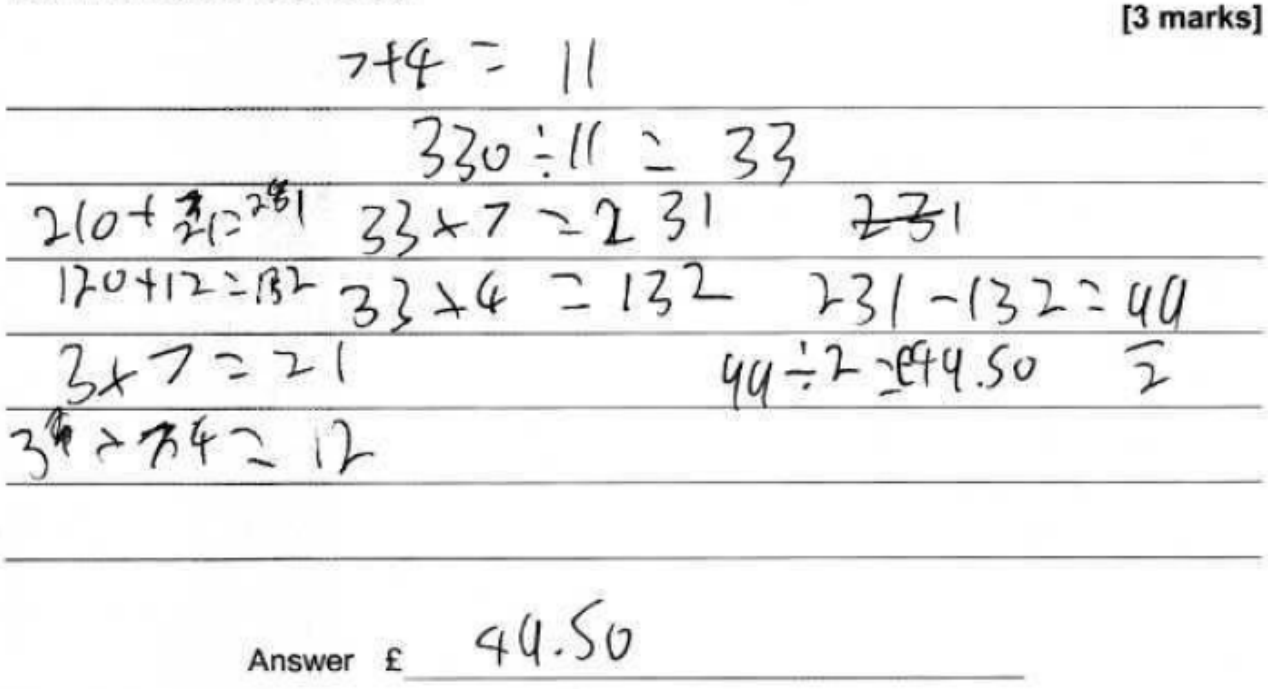
Ed and Fay shared £330 in the ratio 7 : 4

Ed gives Fay some of his money.

Fay now has the same amount as Ed.

How much does Ed give Fay?

[3 marks]



Commentary

Although the numbers look wrong this student has followed the correct method for alternative 1. After adding 7 and 4 they have divided 330 by 11, and although their answer is incorrect they have used it correctly by multiplying by both 7 and 4. They therefore score the first two marks, but obviously not the accuracy mark.

2 marks

Student C

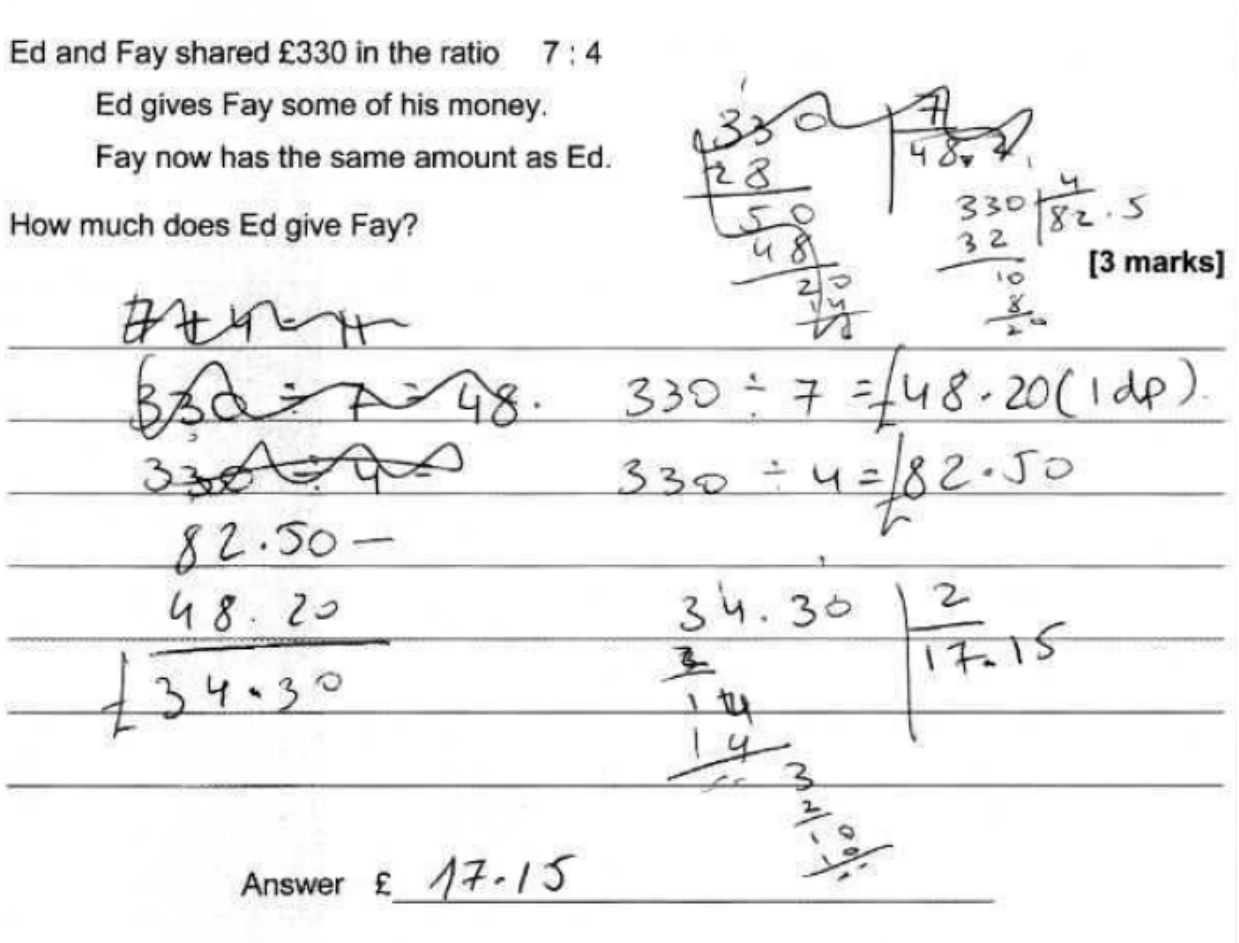
Ed and Fay shared £330 in the ratio 7 : 4

Ed gives Fay some of his money.

Fay now has the same amount as Ed.

How much does Ed give Fay?

[3 marks]



Commentary

This student has started incorrectly by dividing 330 by both 7 and 4. Although they correctly find the midpoint of the difference the second mark is dependent, so as they went wrong on the first mark they can't score the second.

0 marks

Question 11

11 Joe and Kyle share an amount of money in the ratio $7 : n$

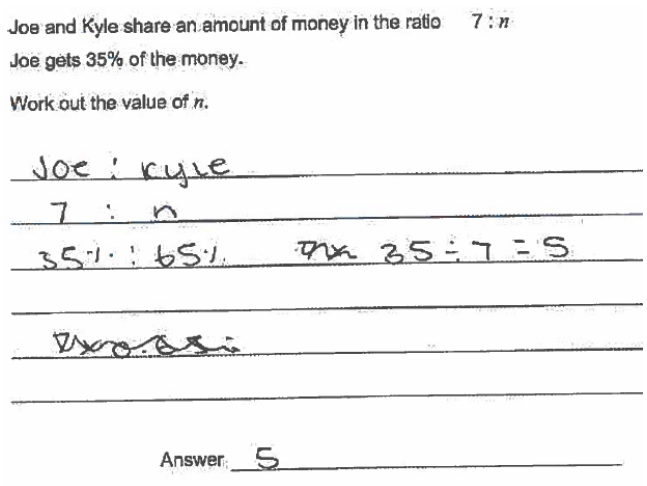
Joe gets 35% of the money.

Work out the value of n.

[2 marks]

Answer _____

Student A

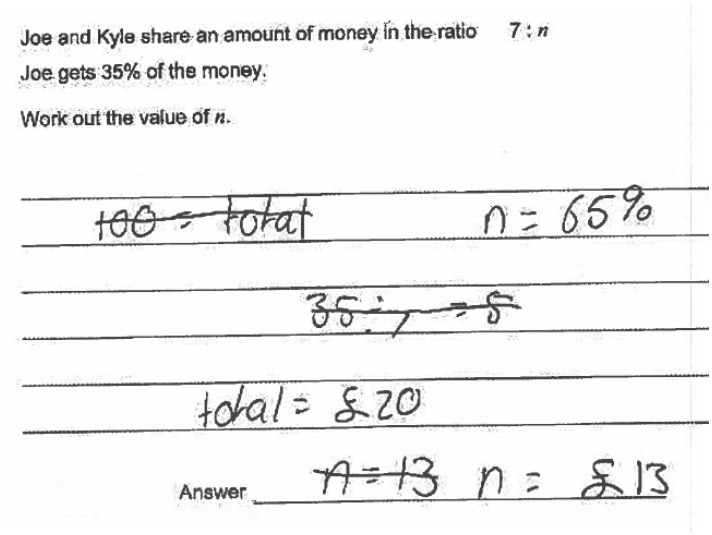


Commentary

This student has made two small steps that may have been rewarded on questions with more marks, but receive no marks here. Subtracting 35% from 100% to get 65% could lead to simplification of a ratio or division of 65 by the 5 also found, but neither are done, so no marks are awarded.

0 marks

Student B

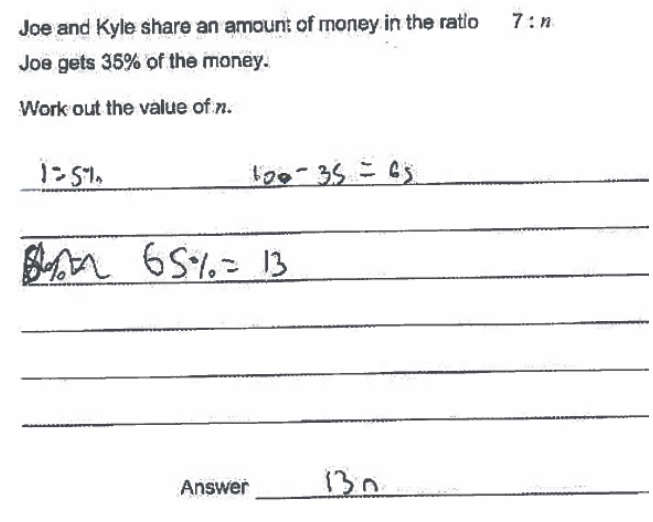


Commentary

Note that the answer here is given as an amount of money, and although the actual amount could be any multiple of 13p this is not penalised in this question.

2 marks

Student C



Commentary

Unlike the addition of money units, the presentation of the answer as an algebraic term does lose the accuracy mark, as the student does not seem to realise that n represents the number 13.

1 mark

Question 11

11 The value of a house is £120000

The value is expected to increase by 5% each year.

Work out the expected value after 4 years.

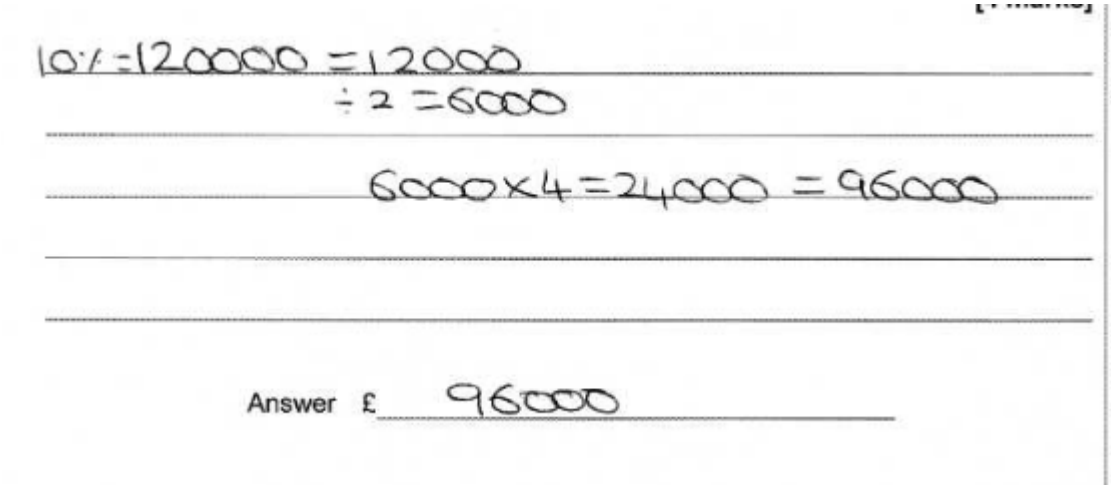
Give your answer to 2 significant figures.

You **must** show your working.

[4 marks]

Answer £_____

Student A

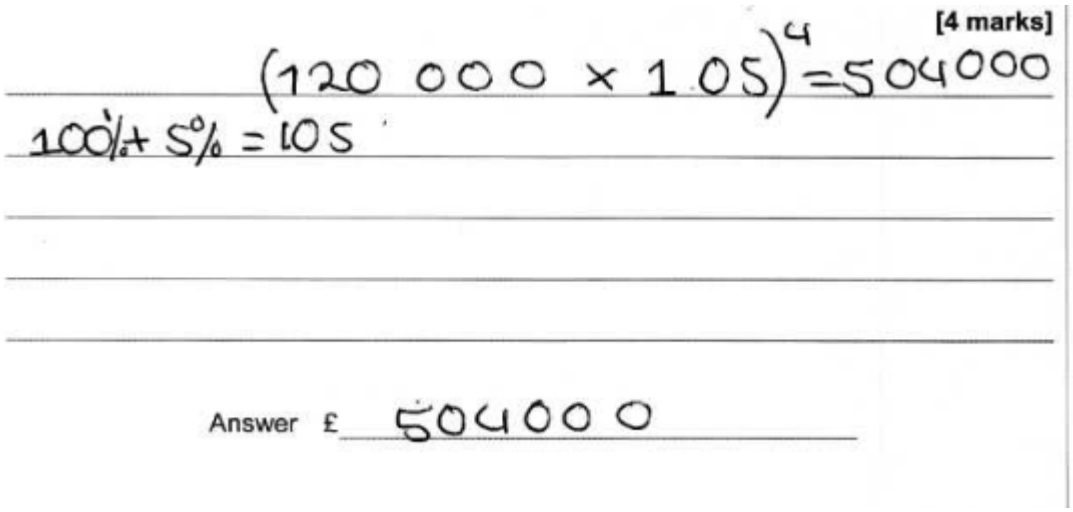


Commentary

This is a standard response, where the student has used simple percentage 'increase' rather than compound. This student has actually subtracted the 24 000 rather than added, but adding as a block does not get any marks either. Note that the last mark, which is independent, cannot be scored here as there is no value to 3 sf or more to be rounded.

0 marks

Student B

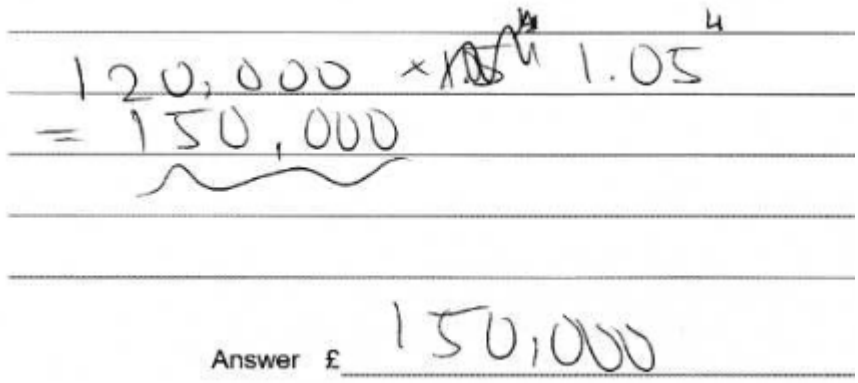


Commentary

Unfortunately, the student has cost themselves at least 2 marks by putting brackets into the calculation, making it incorrect. They could have scored the last mark with a correct rounding, but have rounded to 3 sf rather than 2.

0 marks

Student C



Commentary

This student has shown the required calculation. Note that with this calculation seen the unrounded value does not have to be seen for full marks to be awarded.

4 marks

Question 10

10 y is inversely proportional to x.

Complete the table.

[2 marks]

x	12	6	
y		4	8

Student A

10 y is inversely proportional to x.

Complete the table.

x	12	6	12
y	8	4	8

When $x = 6$, $y = 4$

$$\times 4k\left(6 = \frac{1}{4k}\right)\times 4k$$

$$24k = 1$$

$$k = \frac{1}{24}$$

B 1

Turn over for the next question

Commentary

Both values in the table are incorrect, but even though there are no working lines students can score 1 mark through working. This student has done so by working out a correct value for k. They have put k in the denominator, which is unusual but not mathematically incorrect.

1 mark

Student B

y is inversely proportional to x.

Complete the table.

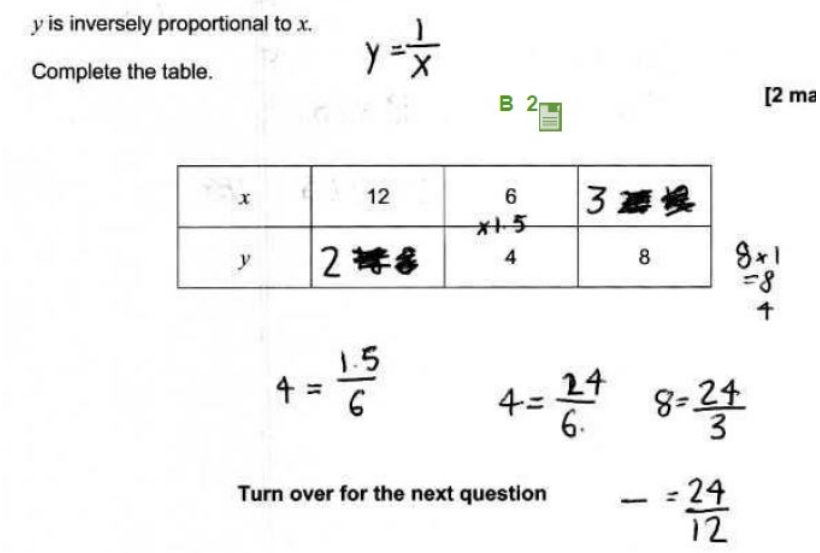
x	12	6	5
y	2	4	8

Commentary

Either of the correct values scores B1, irrespective of the other value, so 2 scores the mark. The student has clearly crossed out their initial value of 10 in that cell and replaced it with 2.

1 mark

Student C



Commentary

The values in the table are correct, so we can ignore any working, although in this case there is no incorrect working.

2 marks

Question 6

6 The height of Zak is 1.86 metres.
The height of Fred is 1.6 metres.

Write the height of Zak as a fraction of the height of Fred.
Give your answer in its simplest form.

[3 marks]

Answer _____

Student A

The height of Zak is 1.86 metres.
The height of Fred is 1.6 metres.

Write the height of Zak as a fraction of the height of Fred.
Give your answer in its simplest form.

[3 marks]

$\frac{186}{1000} = \frac{93}{500}$ $\frac{160}{1000} = \frac{80}{500} = \frac{40}{250}$ $= \frac{4}{25}$

0

Fred $= \frac{80}{500}$

Zak $= \frac{93}{500}$

Answer Zak $= \frac{93}{500}$, Fred $= \frac{80}{500}$

Commentary

This student seems to have concentrated on comparing the heights by introducing a random denominator and simplifying. Unfortunately, that was not the premise of the question, and therefore no marks can be awarded.

0 marks

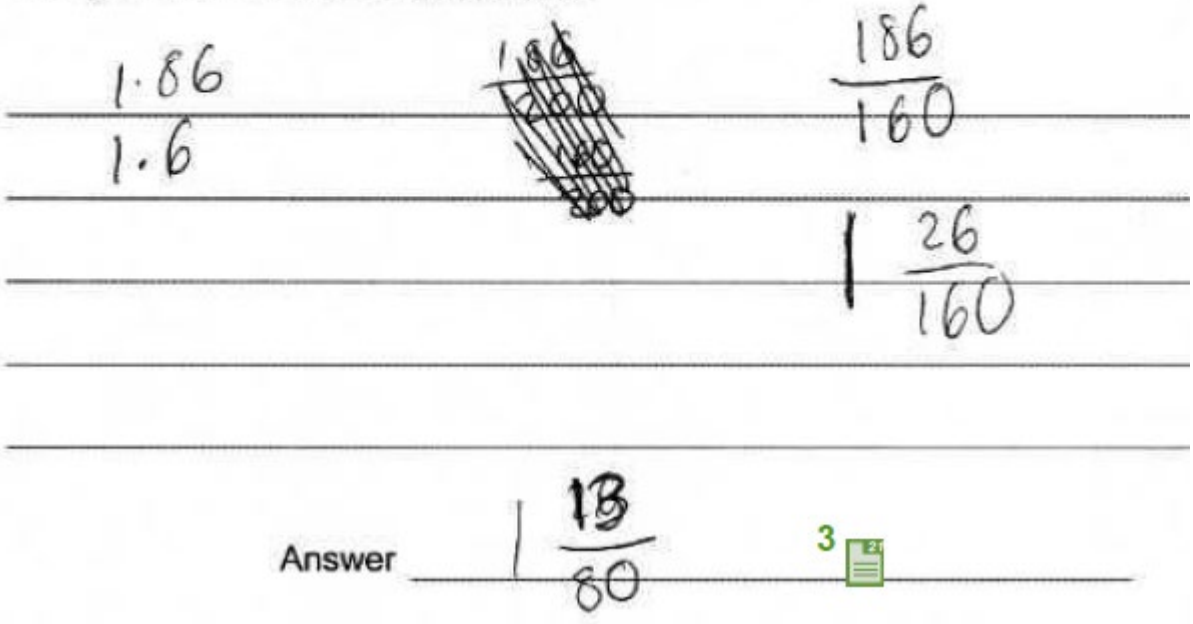
Student B

The height of Zak is 1.86 metres.

The height of Fred is 1.6 metres.

Write the height of Zak as a fraction of the height of Fred.

Give your answer in its simplest form.



Commentary

The student has converted to a mixed number before simplifying, and it could be argued that at no stage did they present the answer as a fraction in its simplest form. However, we were not assessing the difference between a fraction and a mixed number in this question, so are happy to accept the answer in this form.

2 marks

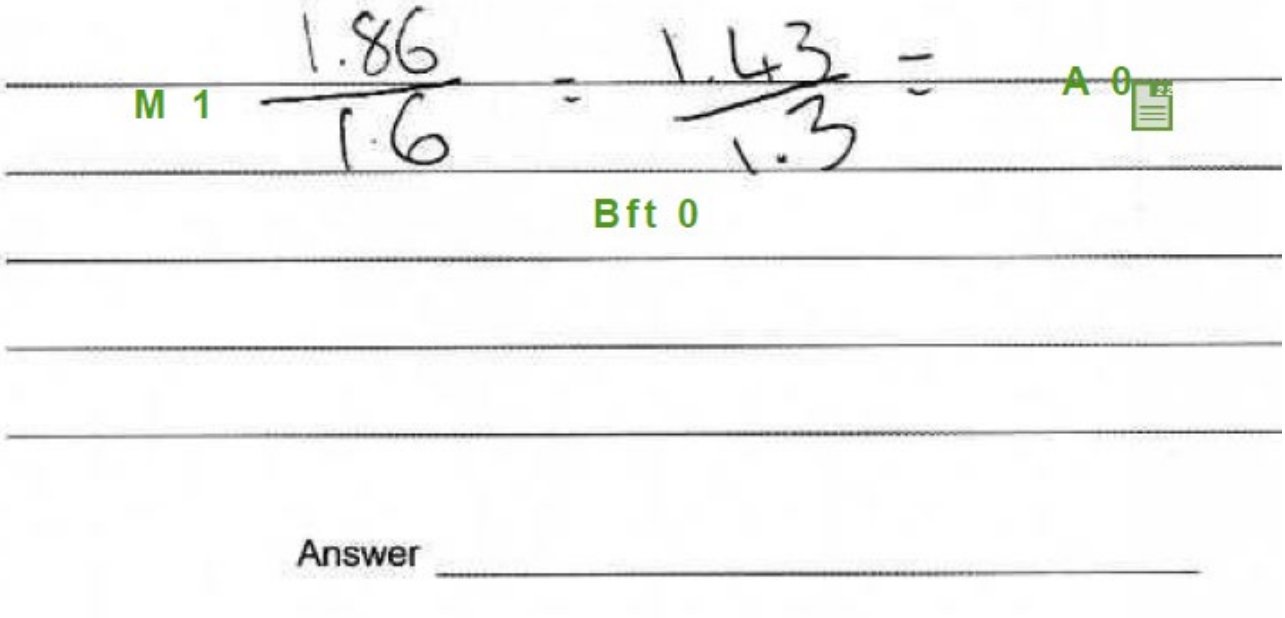
Student C

The height of Zak is 1.86 metres.

The height of Fred is 1.6 metres.

Write the height of Zak as a fraction of the height of Fred.

Give your answer in its simplest form.



Commentary

It may seem strange to award a mark for simply writing the given amounts as a fraction, but doing so in the correct order is the first step in this procedure, so the first mark is awarded. The student has not converted the numerator and denominator values to integers, and therefore cannot score the other marks.

1 mark

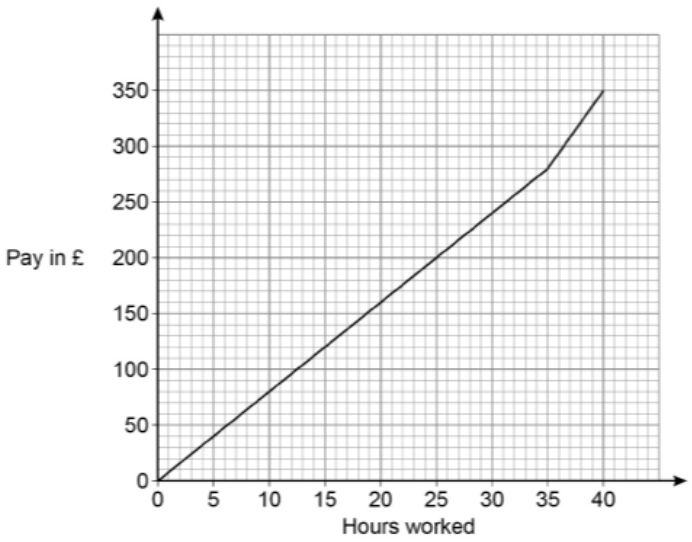
Question 12

12 The graph shows how much Molly is paid for working for up to 40 hours.

She receives

a basic rate of pay for the first 35 hours worked

a higher rate of pay for the next 5 hours worked.



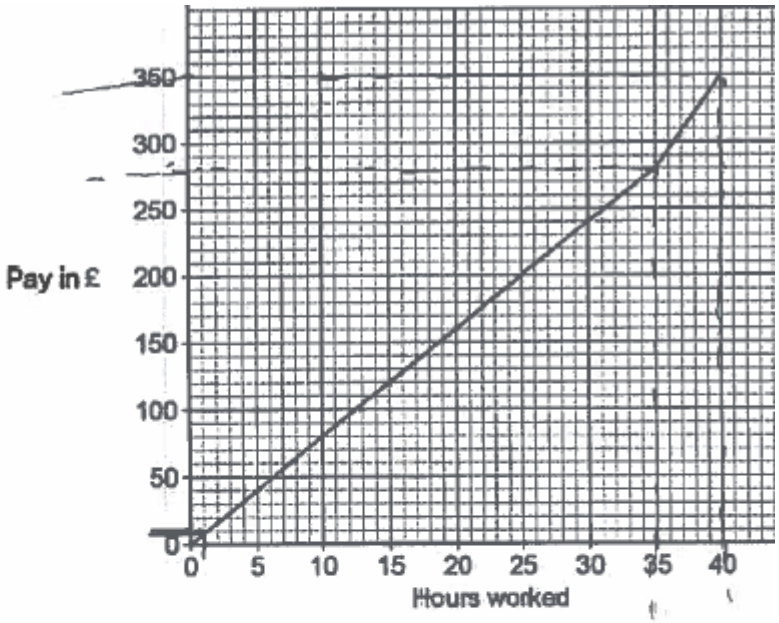
Work out the difference between the higher rate of pay and the basic rate of pay.

Give your answer in £ per hour.

[3 marks]

Answer £_____ per hour

Student A



Work out the difference between the higher rate of pay and the basic rate of pay.
Give your answer in £ per hour.

£280 £350 350 − 280 = £70

(under £10 roughly) → 280 ÷ 35 = £8

estimate → 350 ÷ 40 = £8.75

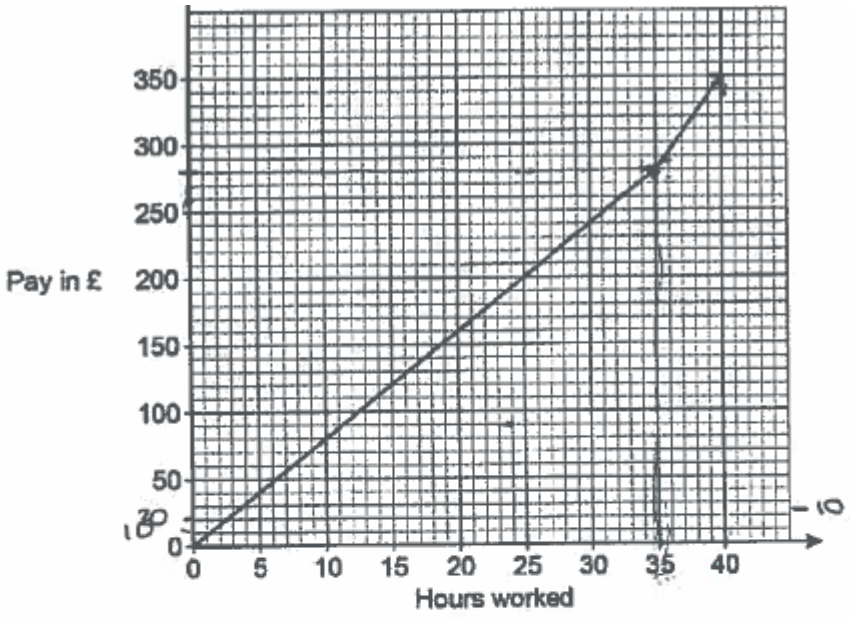
Answer £ 8.75 per hour

Commentary

The student seems to have had an idea of how to answer this question, but has got muddled while working through it. They have worked out that the basic rate is £8, which gets them the first mark. Then, despite marking the graph correctly and working out £70, they have simply divided the total pay by the total number of hours, a common mistake. They have given this value as their answer, but even if they had understood that the difference was required they would not have got the mark for 75p, as this was an accuracy mark.

1 mark

Student B



Work out the difference between the higher rate of pay and the basic rate of pay.

Give your answer in £ per hour.

[3 marks]

Basic rate = £280 for 35 hours

higher rate = £350 for next 5 hours

~~£350 - £280 = £70~~ £280 ÷ 35 = £8 per hour

£350 ÷ 5 = ~~£70~~ £70 per hour

70 - 8 = £62

Answer £ 62 per hour

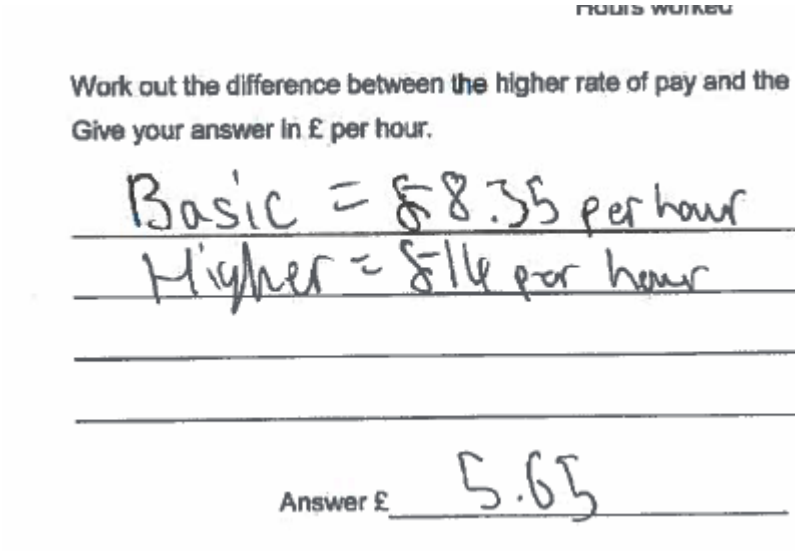
M1

Commentary

The student receives the first mark for £8. They correctly use 5 hours for the higher rate, but use £350 instead of £70. Note that they actually did the correct calculation to work out £70 being the total of higher rate pay, but crossed it out and replaced it, so we can't mark it. This is one of those responses where the unrealistic answer might lead the student to review their work.

1 mark

Student C


Hours worked

Work out the difference between the higher rate of pay and the
Give your answer in £ per hour.

Basic = £8.35 per hour

Higher = £14 per hour

Answer £ 5.65

Commentary

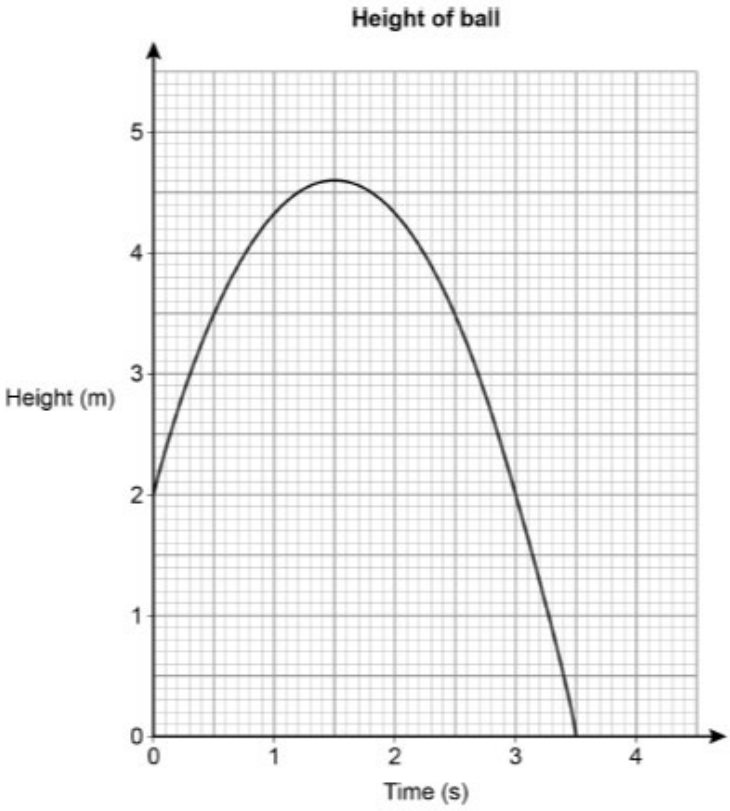
This is a very sparse response, with a minimum of work shown. The value of £8.35 is incorrect, and as we don't know how it was arrived at we can't award a method mark. £14 is correct, so even though we haven't seen any working for it we can award the second mark, which is not dependent on the first. The accuracy mark is only awarded for a correct answer, so not given here.

1 mark

Question 17

17 A ball is thrown vertically upwards.

The graph shows the height of the ball above the ground after it is thrown.



17 (b) After how many seconds is the ball at instantaneous rest when it is in the air?

[1 mark]

Answer _____ s

17 (c) Work out the average speed of the ball when it is moving downwards.

[2 marks]

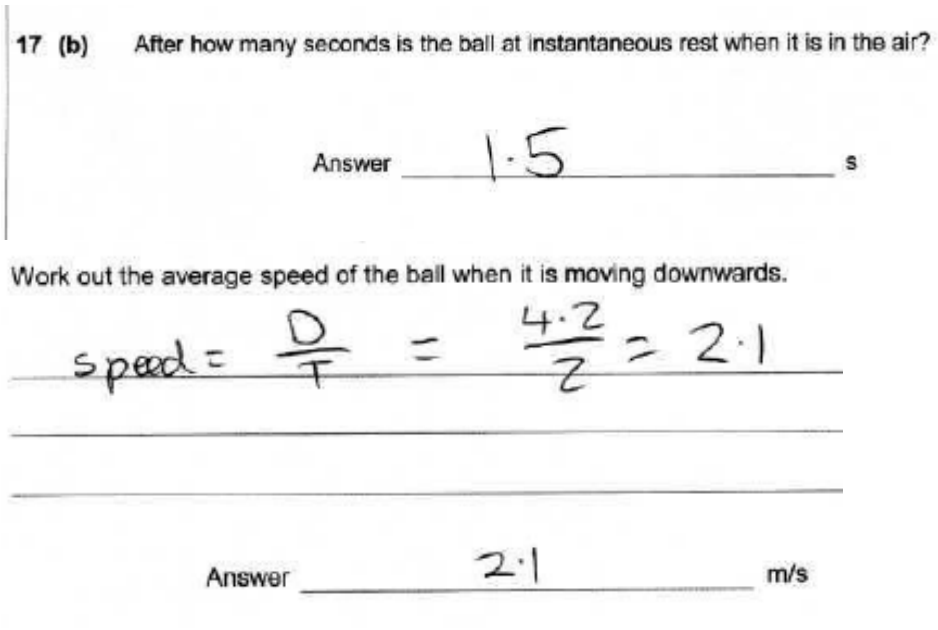
_____

_____

_____

Answer _____ m/s

Student A



17 (b) After how many seconds is the ball at instantaneous rest when it is in the air?

Answer 1.5 s

Work out the average speed of the ball when it is moving downwards.

speed = $\frac{D}{T}$ = $\frac{4.2}{2}$ = 2.1

Answer 2.1 m/s

Commentary

Part (b) is correct, but in part (c) the student has misread the scale as 4.2 rather than 4.6. Unfortunately, this loses them both marks in this part.

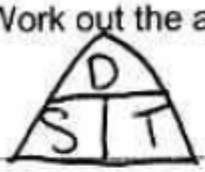
(b) 1 mark
(c) 0 marks

Student B

After how many seconds is the ball at instantaneous rest when it is in the air?

Answer 1.4 s

Work out the average speed of the ball when it is moving downwards.



$S = \frac{D}{T} = \frac{4.5}{2} = 2.25$

Answer 2.25 m/s

Commentary

The student seems to find it difficult to read accurately from the scale. In part (b), they are just within tolerance, so gain the mark, but in part (c) they are just outside the acceptable range and therefore score zero.

(b) 1 mark
(c) 0 marks

Student C

After how many seconds is the ball at instantaneous rest when it is in the air?

Answer 1 s

Work out the average speed of the ball when it is moving downwards.

[2 marks]

distance = speed x time

If in 2 second the ball goes from 4,6 to 0 then the average speed is 4,6 ÷ 2 = 2,3

A Answer 2,3 M m/s

Commentary

In part (b) the answer is incorrect. In part (c), the answer appears to be in a list form, but a glance at the working shows that the student had completed the correct calculation, and is using the continental decimal notation of a comma. This is acceptable, so both marks are awarded.

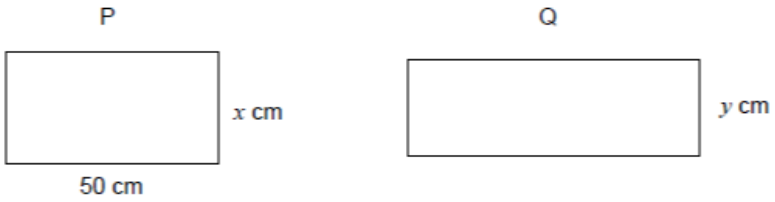
(b) 0 marks
(c) 2 marks

Question 17

17 P is a rectangle with length 50 cm and width x cm

Q is a rectangle with width y cm

Not drawn accurately



The length of Q is 20% **more** than the length of P.

The area of Q is 10% **less** than the area of P.

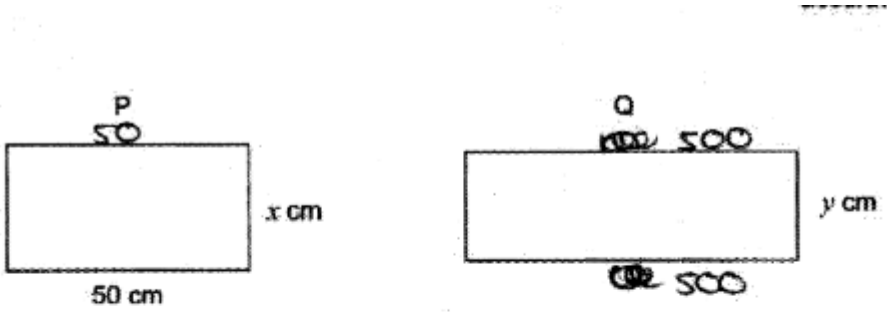
Work out the ratio $x : y$

Give your answer in its simplest form.

[4 marks]

Answer _____ : _____

Student A



The length of Q is 20% **more** than the length of P.

The area of Q is 10% **less** than the area of P.

Work out the ratio $x : y$

Give your answer in its simplest form.

[4 marks]

20% = 10

10% of 50 = 5 x 2 = 10 50 x 10 = 500

50 x 20 = 1000 2000 1500

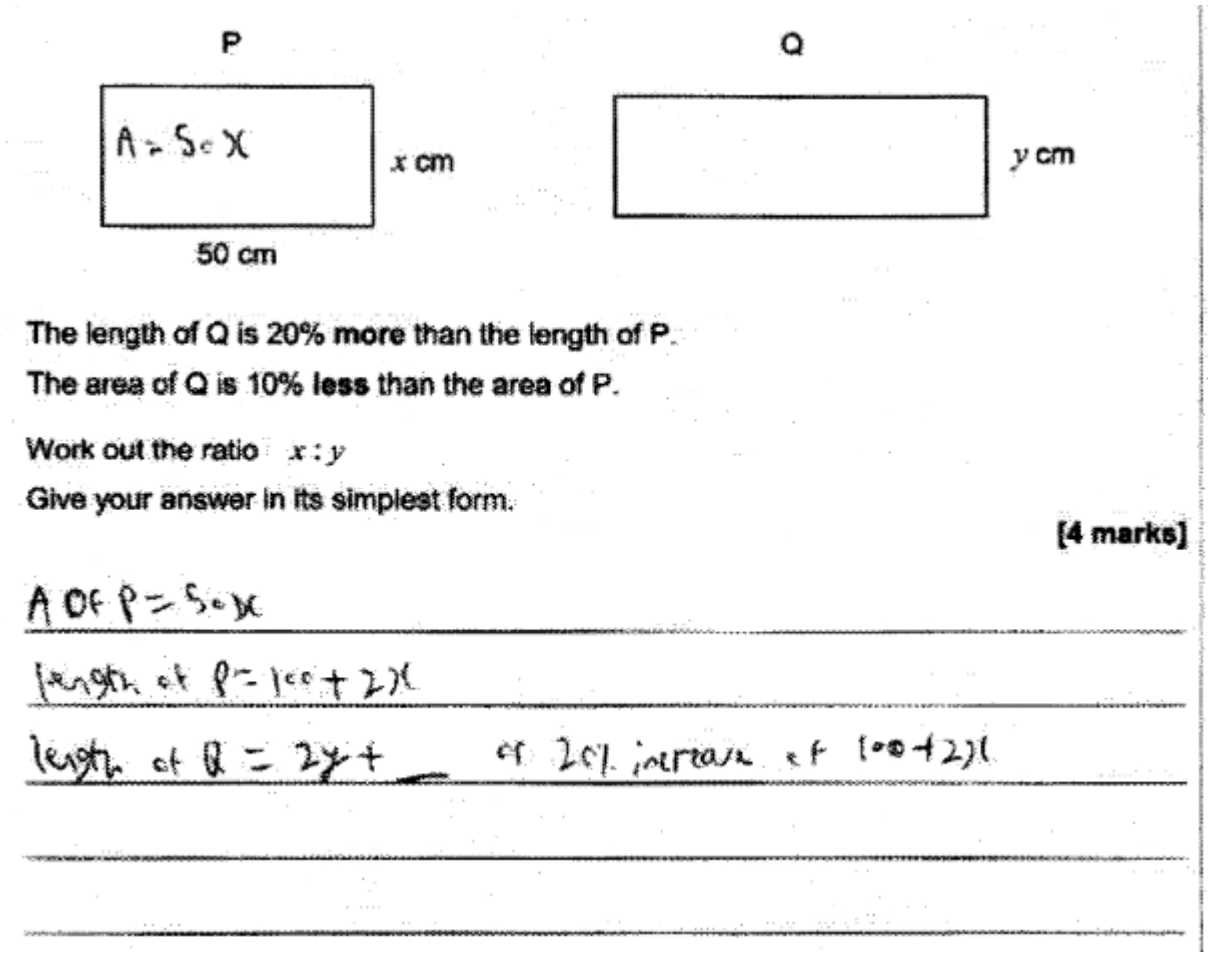
500 x 2 = 1000 2000 1500

Commentary

The student has started by working out 10% of 50, but seems to think that that is the value of x rather than the length of Q. To have gained the first mark they needed to add the 10 to the 50. From there they seem to be trying to work out areas, but exclude the arithmetic terms, so there is no work worthy of a mark.

0 marks

Student B



The length of Q is 20% **more** than the length of P.

The area of Q is 10% **less** than the area of P.

Work out the ratio $x : y$

Give your answer in its simplest form.

[4 marks]

A of P = 50x

length of P = 100 + 2x

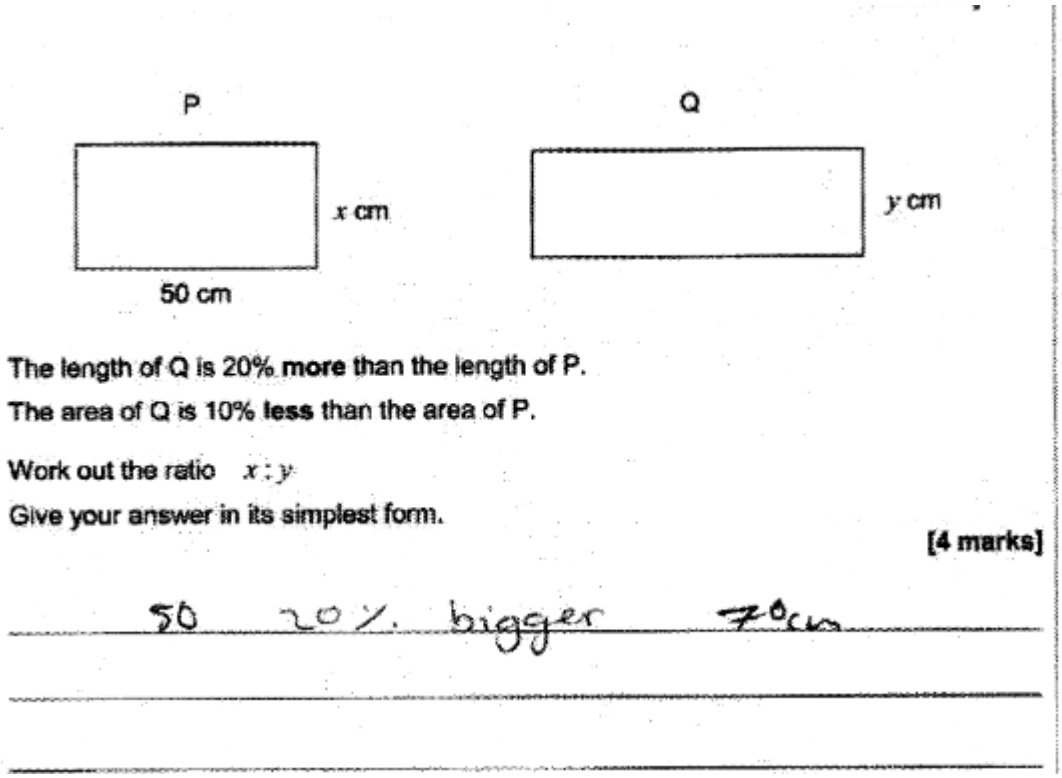
length of Q = 2y + ___ of 20% increase of 100 + 2x

Commentary

The student has given an expression for the area of P, but that in itself does not receive a mark, as it needs to be reduced by 10% before being compared to the area of Q. The rest of the work here seems to be concerned with the perimeter rather than the area.

0 marks

Student C



The length of Q is 20% **more** than the length of P.

The area of Q is 10% **less** than the area of P.

Work out the ratio $x : y$

Give your answer in its simplest form.

[4 marks]

50 20%. bigger 70cm

Commentary

The student understands that they need to increase 50 by 20%, but have simply added 20, which of course receives no marks.

0 marks

Question 23

23 A shopkeeper compares the income from sales of a laptop in March and April.

April

Price	$\frac{1}{5}$ more than March
Number sold	$\frac{1}{4}$ less than March

By what fraction does the income from these sales decrease in April?

[3 marks]

Answer _____

Student A

A shopkeeper compares the income from sales of a laptop in March and April.

	April
Price	$\frac{1}{5}$ more than March
Number sold	$\frac{1}{4}$ less than March

By what fraction does the income from these sales decrease in April?

M 1

$\frac{6}{5} \times \frac{1}{4}$ $\frac{6}{20}$

$\frac{20}{20} - \frac{6}{20} = \frac{14}{20}$

$\frac{14}{20} = \frac{7}{10}$

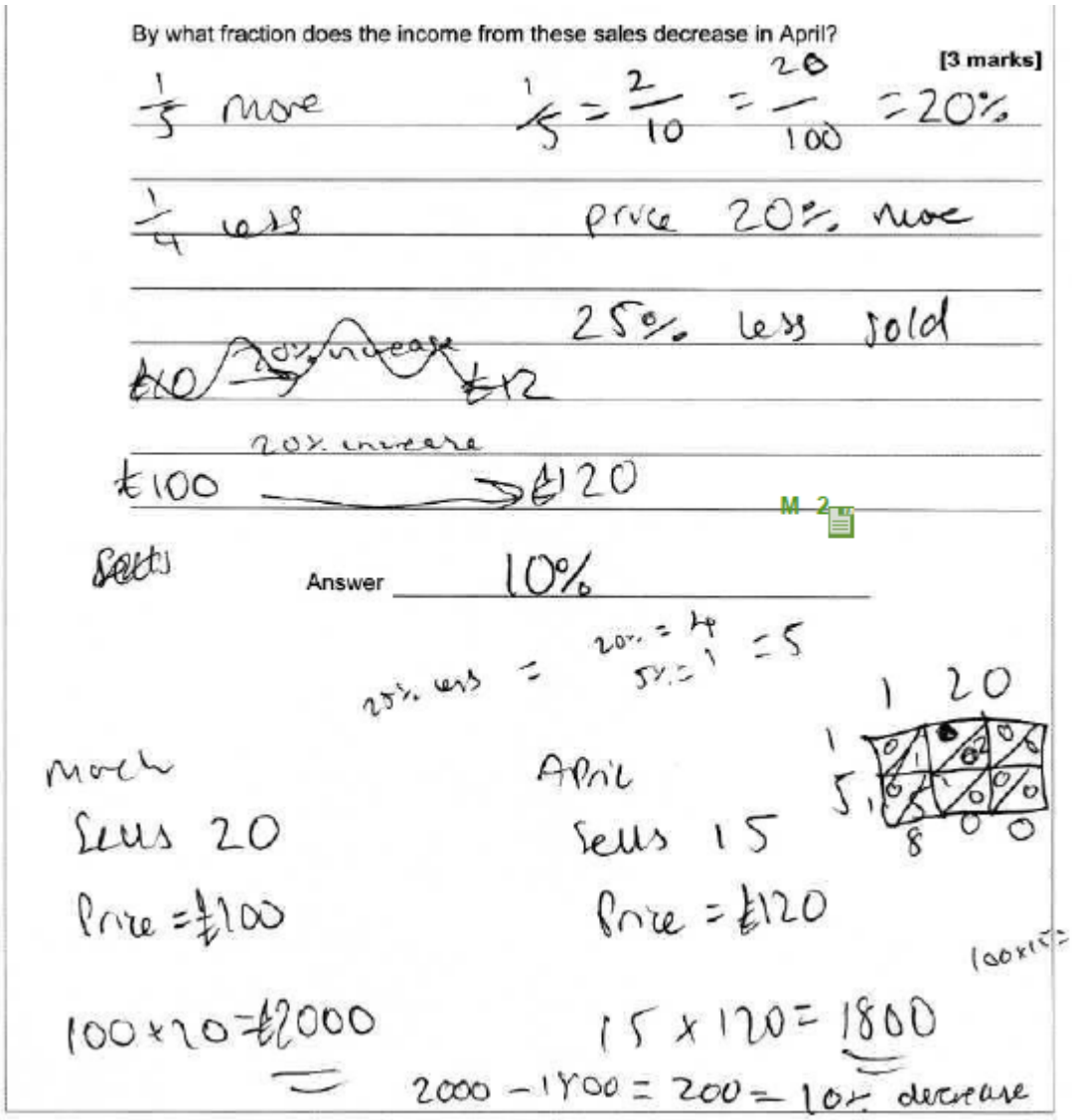
Answer $\frac{7}{10}$

Commentary

The student has correctly introduced the fraction $\frac{6}{5}$, and even though they have used it incorrectly this still qualifies for the first mark. None of the further work scores another mark.

1 mark

Student B

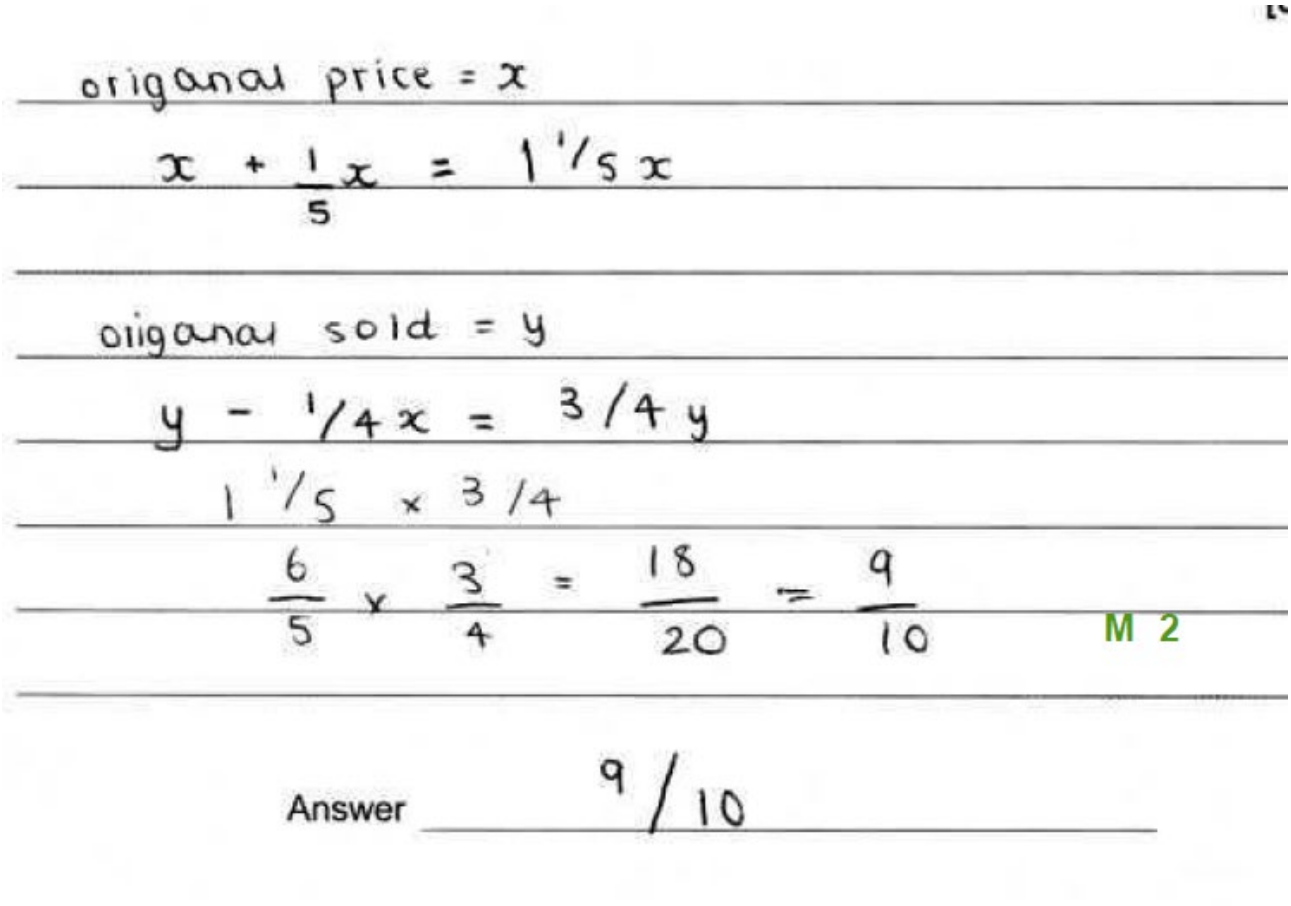


Commentary

This student's working is all over the place, but the answer comes from the bottom of the clip, where they have assumed values for the number sold and price and correctly worked out that income decreases by 10%. Unfortunately, the question specifically asked for the fractional decrease, so the final mark cannot be awarded.

2 marks

Student C



Commentary

After a spot of algebra, where eventually the student realised they could go no further, they hit on the correct calculation to work out the fraction of the previous amount. Unfortunately, they did not think through that it was the fractional decrease that was required, so they only score the first two marks.

2 marks

Question 2

Please see the mark scheme

Question 21

21 y is inversely proportional to $\sqrt{x}$

$y = 4$ when $x = 9$

21 (a) Work out an equation connecting y and x.

[3 marks]

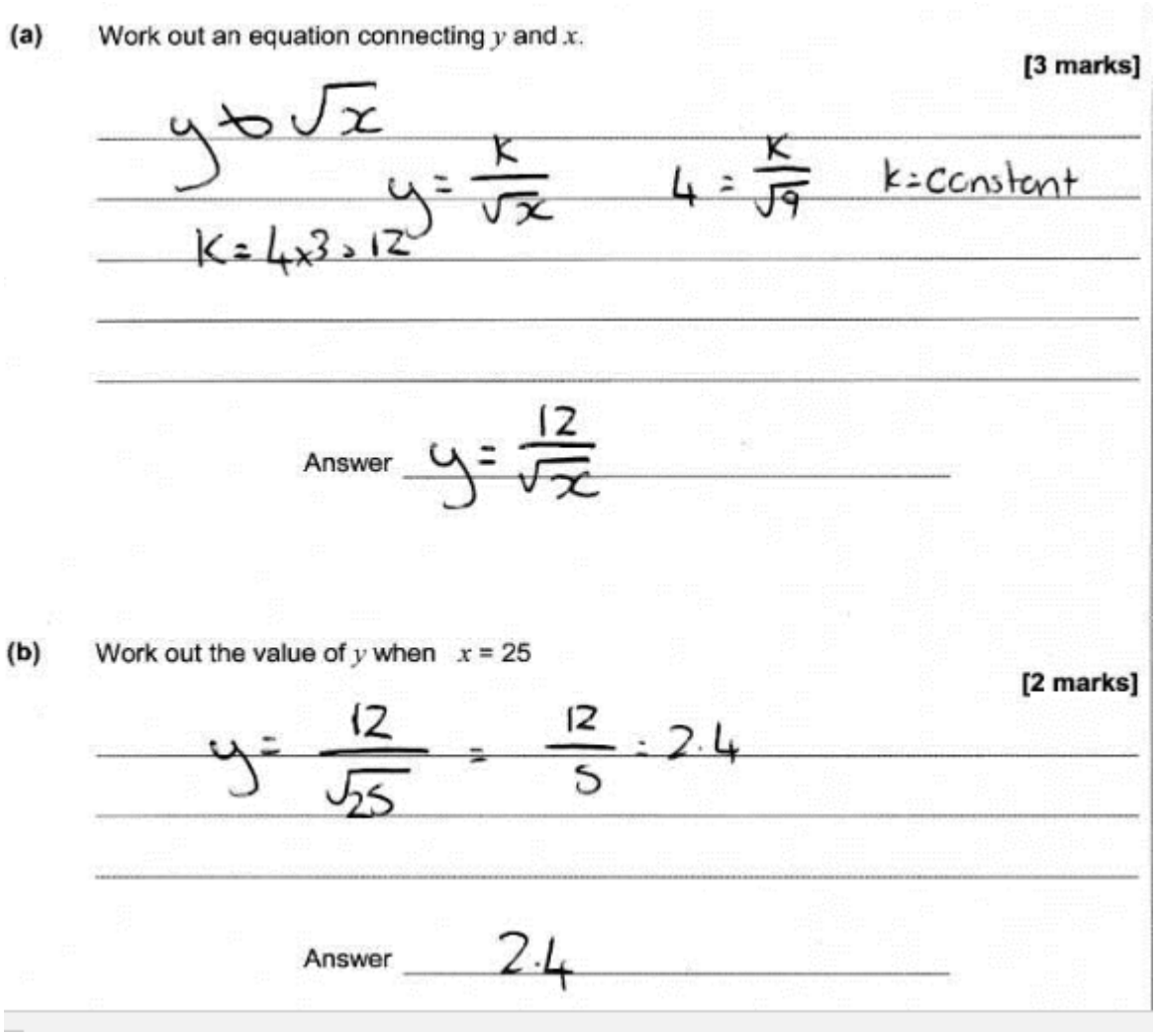
Answer _____

21 (b) Work out the value of y when $x = 25$

[2 marks]

Answer _____

Student A



Commentary

Note that the proportion statement on the first line of part (a) is incorrect, but the student has recovered from there and is not penalised. They have calculated the correct value in part (b).

(a) 3 marks
(b) 2 marks

Question 26

26 b is two thirds of c.

$5a = 4c$

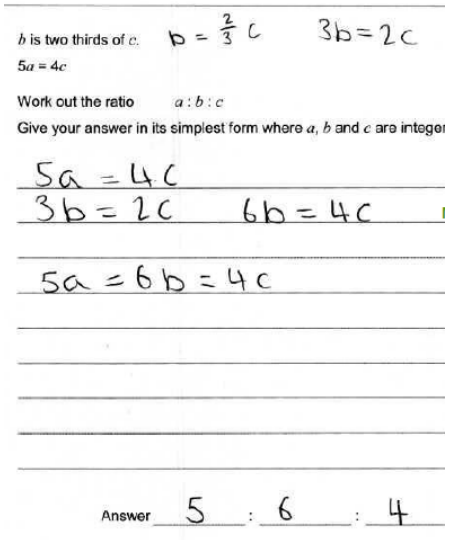
Work out the ratio $a : b : c$

Give your answer in its simplest form where a, b and c are integers.

[3 marks]

Answer _____ : _____ : _____

Student A

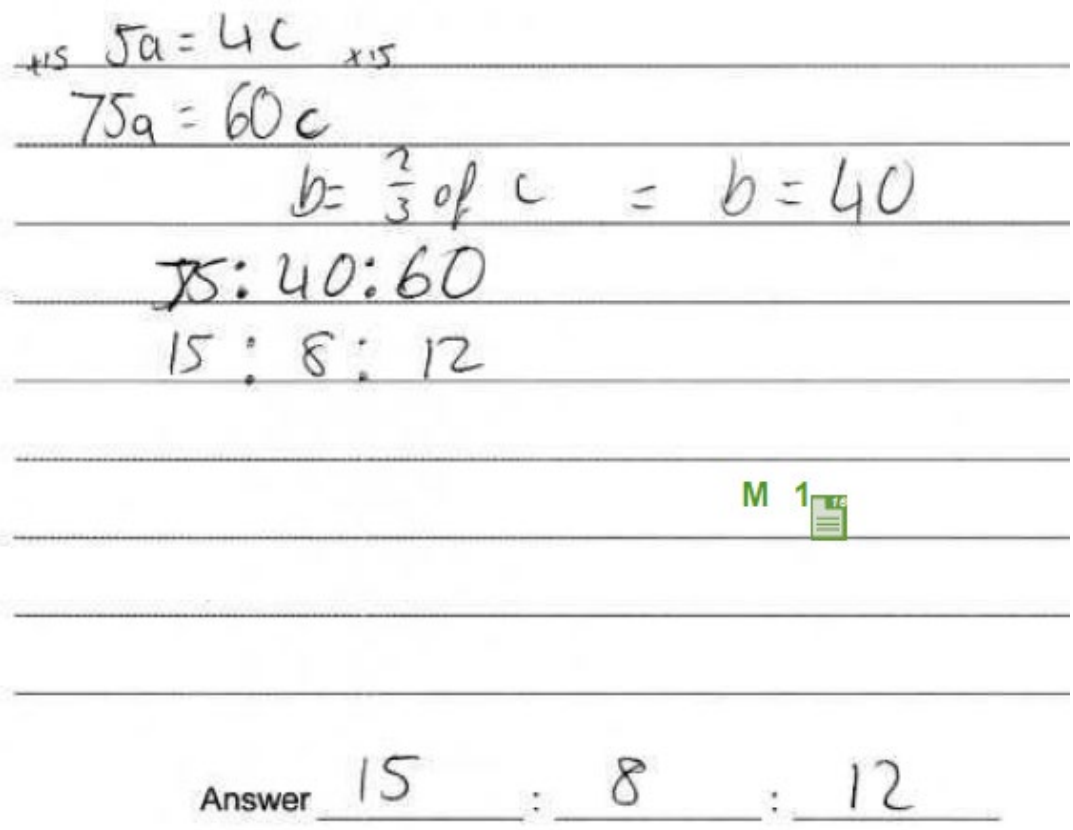


Commentary

This is a tricky question, and many students were unable to make much headway with it. However, there is a fairly easy mark on alternative method 3 for 6b = 4c, and this student achieves that mark. They are unable to make any further progress.

1 mark

Student B



Commentary

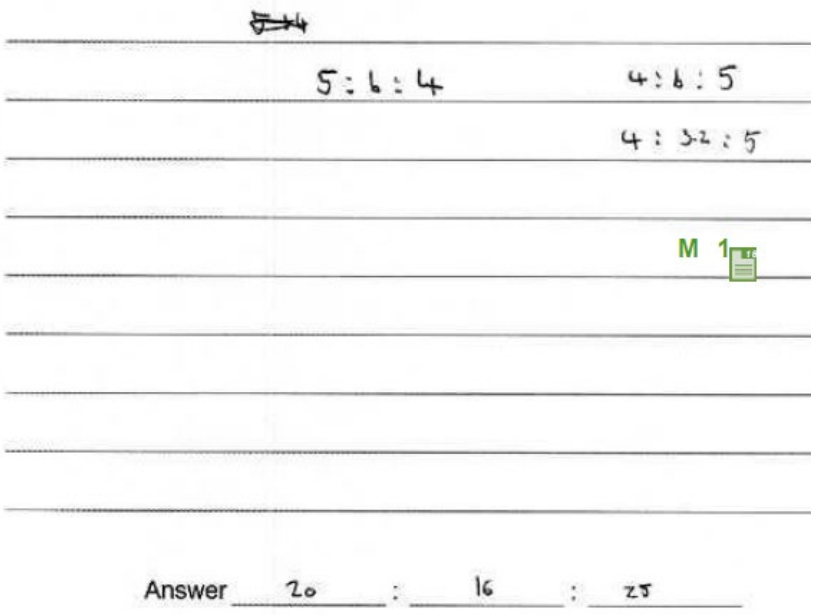
In alternative method 2 the first mark is awarded if the first and third values are in the correct ratio (4 : 5) or the second and third values are in the correct ratio (2 : 3). Here, the second and third values are in the correct ratio, so a mark is awarded.

1 mark

Student C

Work out the ratio $a : b : c$

Give your answer in its simplest form where a, b and c are integers.



Commentary

It's easy to miss this, but the first and third values are in the ratio 4 : 5, which scores the first mark on alternative method 2.

1 mark