

Name

Class



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Algebraic fractions

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

10 Simplify $\frac{4(y+3)^3}{(y+3)^2}$



.....
(1)

November 2019 – Paper 3H

(Total for Question 10 is 1 mark)

10 Simplify $\frac{x-1}{5(x-1)^2}$

.....
(1)

November 2018 – Paper 1H

(Total for Question 10 is 1 mark)

11 Solve $\frac{3x - 2}{4} - \frac{2x + 5}{3} = \frac{1 - x}{6}$



$x =$

June 2017 – Paper 2H

(Total for Question 11 is 4 marks)

12 Express $\frac{x}{x+2} + \frac{2x}{x-4}$ as a single fraction in its simplest form.



.....
(3)

November 2020 – Paper 3H

(Total for Question 12 is 3 marks)

12 (a) Write $\frac{4x^2 - 9}{6x + 9} \times \frac{2x}{x^2 - 3x}$ in the form $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.



.....
(3)

(b) Express $\frac{3}{x+1} + \frac{1}{x-2} - \frac{4}{x}$ as a single fraction in its simplest form.

.....
(3)

13 Show that $6 + \left[(x + 5) \div \frac{x^2 + 3x - 10}{x - 1} \right]$ simplifies to $\frac{ax - b}{cx - d}$ where a , b , c and d are integers.



13 (a) Write $\frac{5}{x+1} + \frac{2}{3x}$ as a single fraction in its simplest form.

.....
(2)

November 2019 – Paper 1H

(Total for Question 13 is 2 marks)

14 The ratio $(y+x):(y-x)$ is equivalent to $k:1$

Show that $y = \frac{x(k+1)}{k-1}$

November 2017 – Paper 1H

(Total for Question 14 is 3 marks)

14 Simplify $\frac{x^2 - 16}{2x^2 - 5x - 12}$



.....
(3)

June 2017 – Paper 3H

(Total for Question 14 is 3 marks)

14 Solve $\frac{x+2}{3x} + \frac{x-2}{2x} = 3$

$x =$

Specimen 1 – Paper 1H

(Total for Question 14 is 3 marks)

14 Show that $\frac{x^2 - x - 6}{2x^2 - 5x - 3}$ can be written in the form $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.



14 Write



$$4 - \left[(x + 3) \div \frac{x^2 + 5x + 6}{x - 2} \right]$$

as a single fraction in its simplest form.
You must show your working.

15 (a) Simplify fully $\frac{(a-3)^2}{5(a-3)}$



.....
(1)

(b) Simplify fully $\frac{4-x^2}{x^2+3x} \div \frac{x+2}{x+3}$

.....
(3)

15 Show that $\frac{4x+3}{2x} + \frac{3}{5}$ can be written in the form $\frac{ax+b}{cx}$ where a , b and c are integers.

15 Show that $\frac{2x^2 - 3x - 5}{x^2 + 6x + 5}$ can be written in the form $\frac{ax + b}{cx + d}$ where a , b , c and d are integers.

Specimen 1 – Paper 1H

(Total for Question 15 is 3 marks)

15 Show that $\frac{a}{b+1} - \frac{a}{(b+1)^2}$ can be written as $\frac{ab}{(b+1)^2}$

Specimen 2 – Paper 3H

(Total for Question 15 is 2 marks)

16 Show that $\frac{1}{6x^2 + 7x - 5} \div \frac{1}{4x^2 - 1}$ simplifies to $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.



17 Given that

$$x^2 : (3x + 5) = 1 : 2$$

find the possible values of x .

17 Simplify fully $\frac{3x^2 - 8x - 3}{2x^2 - 6x}$

19 Solve $\frac{1}{2x-1} + \frac{3}{x-1} = 1$

Give your answer in the form $\frac{p \pm \sqrt{q}}{2}$ where p and q are integers.

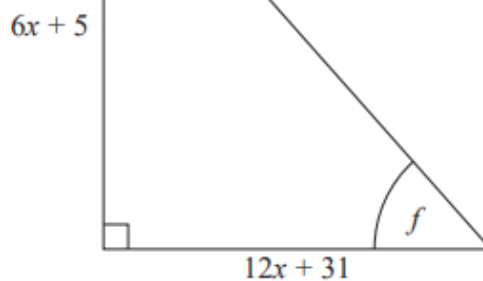
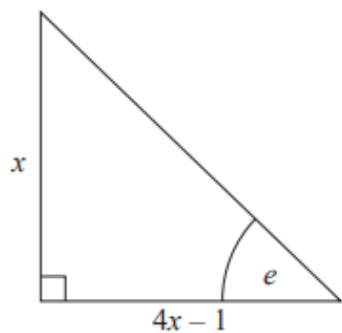
- 19** Show that $\frac{3x}{x+2} - \frac{2x+1}{x-2} - 1$ can be written in the form $\frac{ax+b}{x^2-4}$
where a and b are integers.



19 Solve $\frac{1}{x} - \frac{1}{x+1} = 4$

Give your answer in the form $a \pm b\sqrt{2}$ where a and b are fractions.

19 Here are two right-angled triangles.



Given that

$$\tan e = \tan f$$

find the value of x .

You must show all your working.

- 19** $2 - \frac{x+2}{x-3} - \frac{x-6}{x+3}$ can be written as a single fraction in the form $\frac{ax+b}{x^2-9}$ where a and b are integers.



Work out the value of a and the value of b .

$a =$

$b =$

20 Write



$\frac{14}{3x-21} + \left[(x+4) \div \frac{2x^2-6x-56}{2x+3} \right]$ in the form $\frac{ax+b}{cx+d}$ where a, b, c and d are integers.

20 Show that $\frac{3x+6}{x^2-3x-10} \div \frac{x+5}{x^3-25x}$ simplifies to ax where a is an integer.

21 Solve $\frac{1}{x+4} + \frac{3}{2-2x} = 1$



- 22** Show that $\frac{6x^3}{(9x^2 - 144)} \div \frac{2x^4}{3(x - 4)}$ can be written in the form $\frac{1}{x(x + r)}$ where r is an integer.



22 $\frac{2x+3}{x-5} + \frac{x-4}{x+5} - 3$ can be written in the form $\frac{ax+b}{x^2-25}$ where a and b are integers.



Work out the value of a and the value of b .
You must show all your working.

$a =$

$b =$

22 Show that $\frac{7x-14}{x^2+4x-12} \div \frac{x-6}{x^3-36x}$ simplifies to ax where a is an integer.



23 Given that $\frac{2x^2 + y^2}{4x^2 - y^2} = \frac{43}{11}$ where $x > 0$ and $y > 0$



find, in its simplest form, the ratio $x:y$