Algebraic manipulation – 2021 O Level Math D
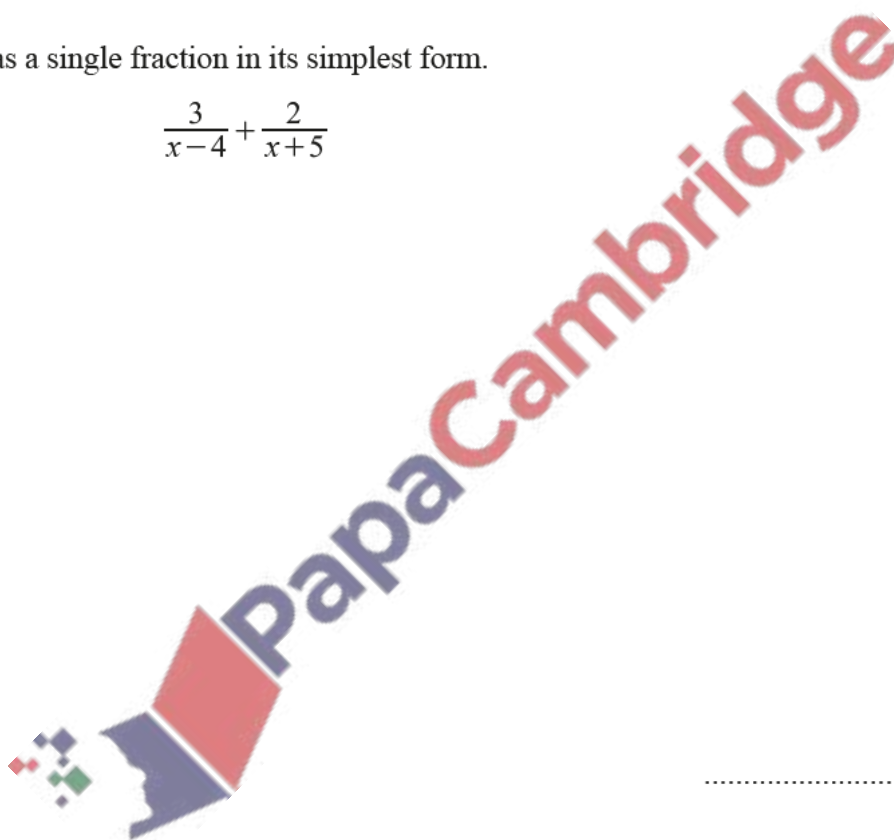
1. Nov/2021/Paper_11/No.23
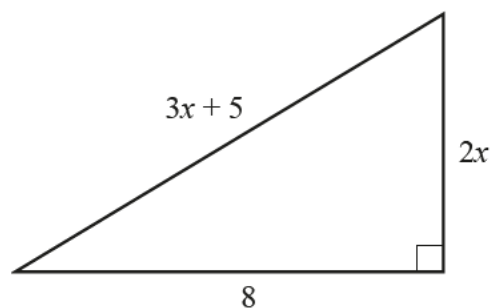
   (a) Expand and simplify.

   $$(x+5)(x-2)$$

   .... [2]

   (b) Write as a single fraction in its simplest form.

   $$\frac{3}{x-4}+\frac{2}{x+5}$$

   .... [3]

2.

(a)

NOT TO
SCALE

The diagram shows a right-angled triangle, with dimensions given in centimetres.
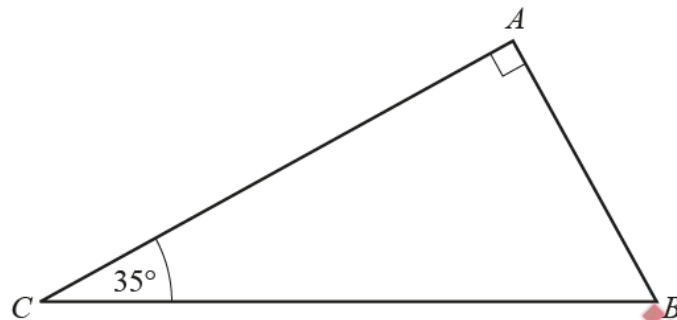
(i) Show that $5x^2 + 30x - 39 = 0$.

[3]

(ii) Solve the equation $5x^2 + 30x - 39 = 0$.
Show your working and give your answers correct to 2 decimal places.

$x = $ .... or $x = $ .... [3]

(iii) Calculate the area of the triangle.

.... cm^2 [2]

(b)
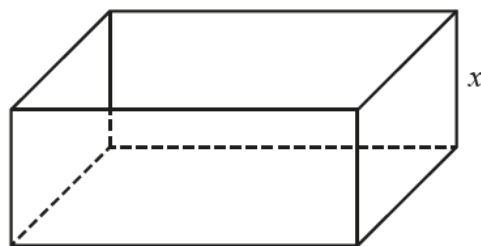

The diagram shows a different right-angled triangle.
The length of the hypotenuse is 12 cm.

Calculate the shortest distance from A to BC.

.... cm [4]

The diagram shows an open box in the shape of a cuboid.

The height of the box is x cm.
The width of the box is 5 cm more than its height.
The length of the box is two times its width.

(a) Write down expressions, in terms of x, for the width and the length of the box.

Width = ... cm

Length = ... cm **[2]**

(b) The external surface area of the open box is 210 cm^2.

Form an equation in x and show that it simplifies to $4x^2 + 25x - 80 = 0$.

[4]

4

(c) Solve the equation $4x^2 + 25x - 80 = 0$.

Show your working and give your answers correct to 2 decimal places.

$x =$ .... or $x =$ .... **[3]**

(d) Calculate the volume of the box.

.... cm^3 **[2]**

(e) The box is filled with chocolates.

The mass of the chocolates is 250 g, correct to the nearest 10 grams.

The total mass of the box and chocolates is 262 g, correct to the nearest gram.

Calculate the lower bound of the mass of the box.

.... g **[3]**
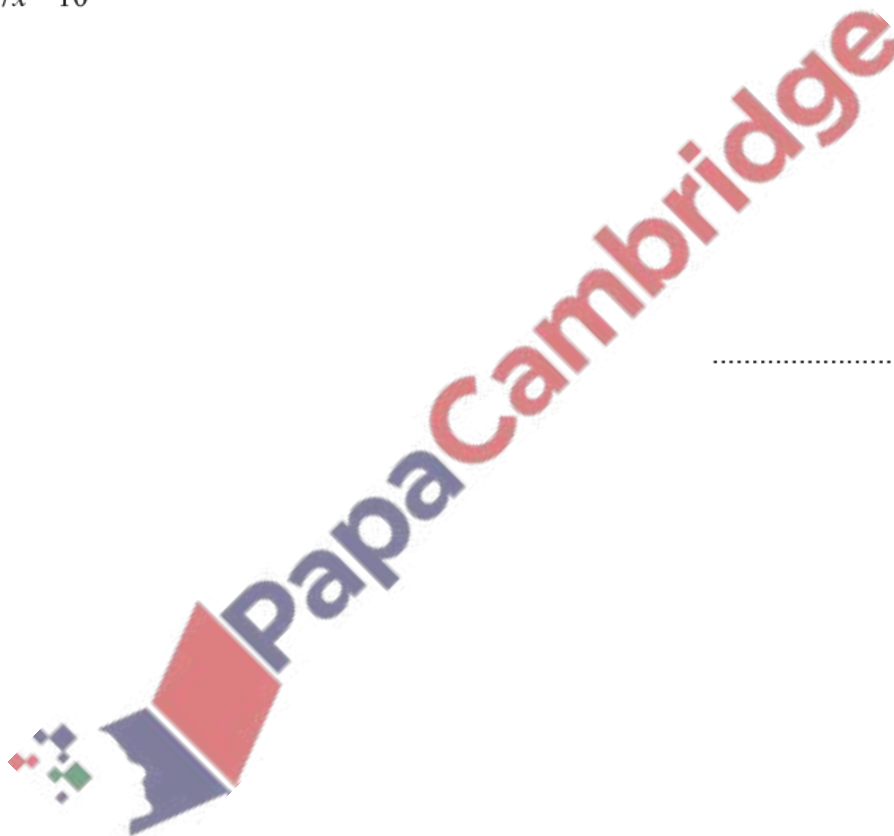
4.

Factorise.

(a) $3cx + 2bx - 6cy - 4by$

.... [2]

(b) $6x^2 + 7x - 10$

.... [2]

5.

(a) Write $x^2 + 10x + 6$ in the form $(x+a)^2 + b$.

.... [2]

(b) Use your answer to **part (a)** to solve $x^2 + 10x + 6 = 0$.

Give your answer in the form $p \pm \sqrt{q}$.

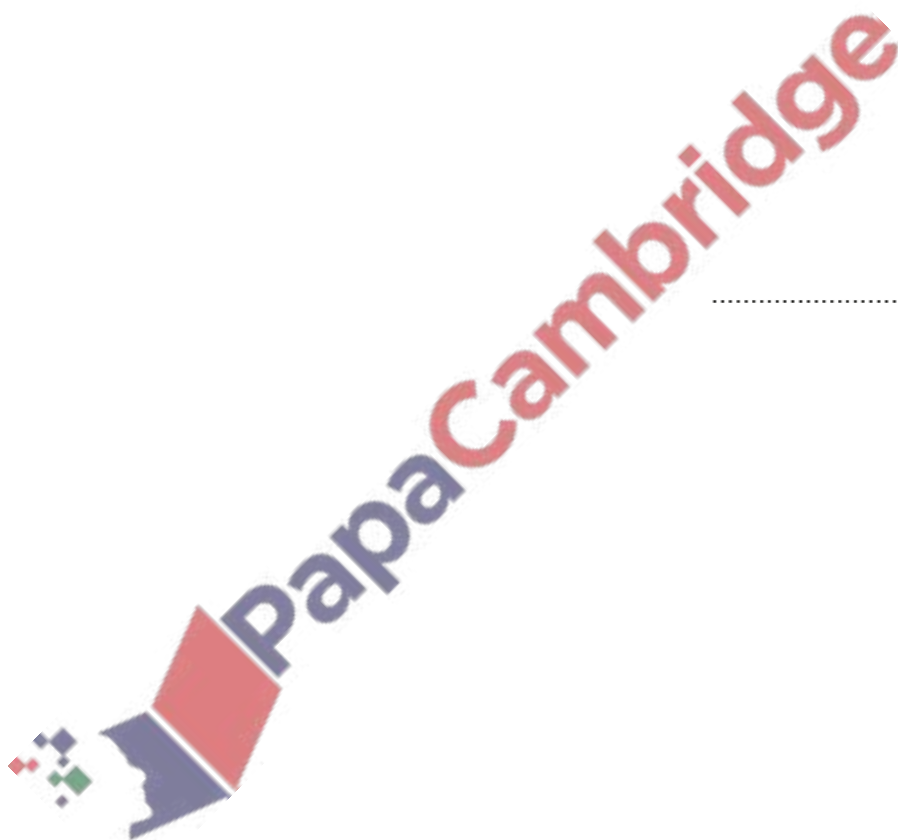$x =$ .... [1]

6.
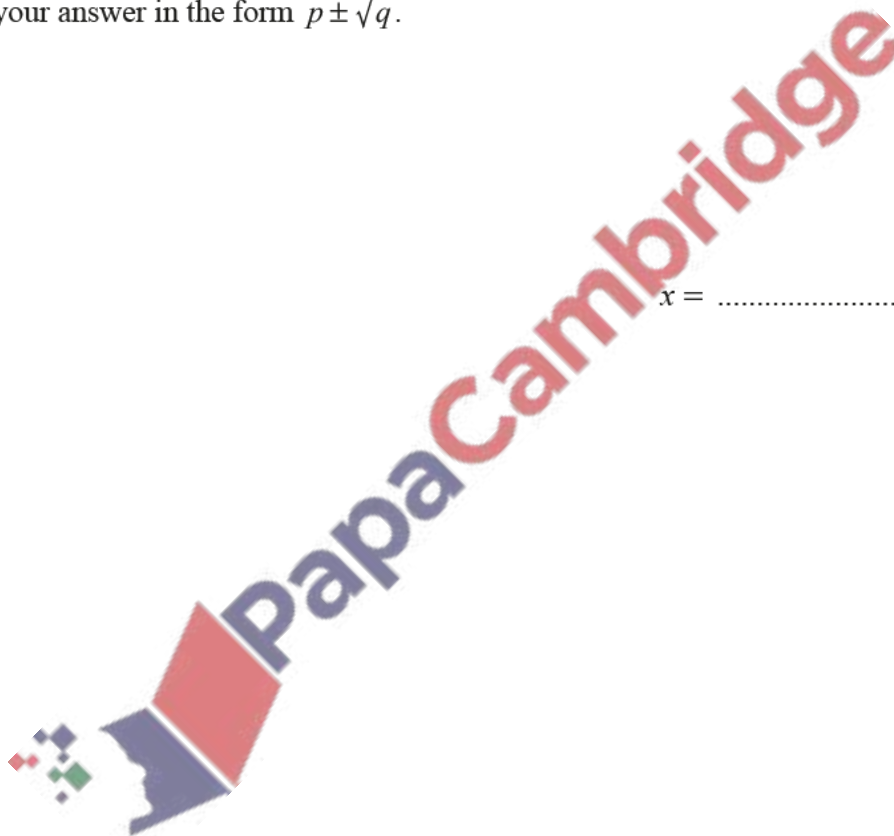
Express as a single fraction in its simplest form.

$$\frac{3}{x-7}+\frac{2}{x+5}$$

.... [3]

The algebraic fraction $\dfrac{2x^2 - 5x + a}{x^2 - 16}$ can be simplified to give $\dfrac{2x + b}{x + 4}$.

Find the value of a and the value of b.

$a =$ ....

$b =$ .... [3]