Name ANSWERS	Class

MATHS TEACHER HUB

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Forming expressions

(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

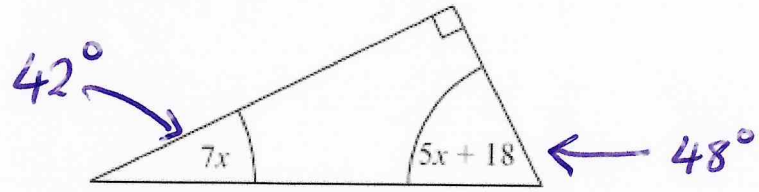
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

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.

1 The diagram shows a right-angled triangle.



All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

$90 + 7x + 5x + 18 = 180$

$108 + 12x = 180$

$12x = 72$

$x = 6$

42 °

(Total for Question 1 is 3 marks)

3 Rick, Selma and Tony are playing a game with counters.

Rick has some counters.
Selma has twice as many counters as Rick.
Tony has 6 counters less than Selma.

In total they have 54 counters.

the number of counters Rick has : the number of counters Tony has = 1 : p

Work out the value of p.

R : S : T

x $2x$ $2x-6$ $= 54$

$5x - 6 = 54$

$5x = 60$

$x = 12$

R : S : T

12 24 18

R : T

12 : 18

1 : $\frac{18}{12}$

1 : 1.5

$p =$ 1.5

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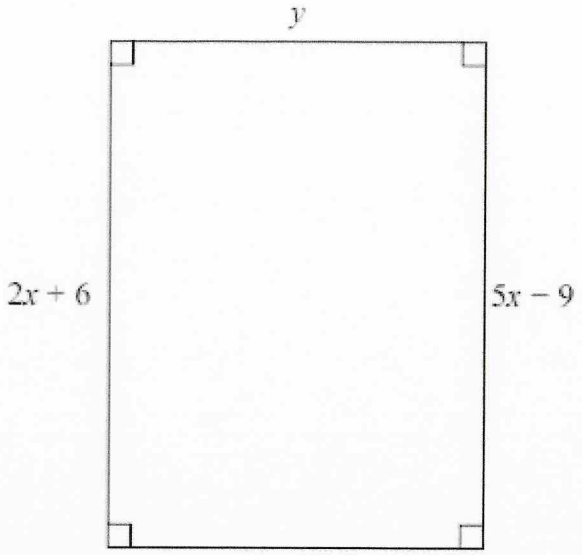
(Total for Question 3 is 5 marks)

6 Here is a rectangle.



All measurements are in centimetres.

The area of the rectangle is 48 cm^2.

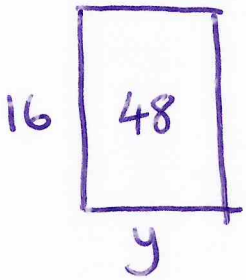
Show that $y = 3$

$2x + 6 = 5x - 9$

$6 = 3x - 9$

$15 = 3x$

$5 = x$



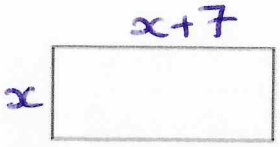
$16 \times y = 48$

$y = \frac{48}{16} = \frac{24}{8} = \frac{12}{4} = 3$

$y = 3$

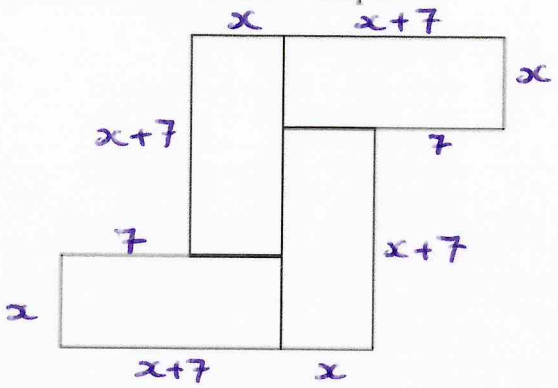
(Total for Question 6 is 4 marks)

6 Here is a rectangle.



The length of the rectangle is 7 cm longer than the width of the rectangle.

4 of these rectangles are used to make this 8-sided shape.



The perimeter of the 8-sided shape is 70 cm.

Work out the area of the 8-sided shape.

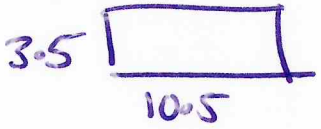
$x + x+7 + x + 7 + x+7 + x + x+7 + x + 7 + x+7$

$= 8x + 42$

$8x + 42 = 70$

$8x = 28$

$x = 3.5$



Area $= 3.5 \times 10.5 = 36.75 cm^2$

$\times 4 = 147 cm^2$

147 cm²

(Total for Question 6 is 5 marks)

7 Mano has three shelves of books.

There are x books on shelf **A**.
There are $(3x + 1)$ books on shelf **B**.
There are $(2x - 5)$ books on shelf **C**.

There is a total of 44 books on the three shelves.

All the books have the same mass.

The books on shelf **B** have a total mass of 7500 g.

Work out the total mass of the books on shelf **A**.

A B C

x $3x+1$ $2x-5$ $= 44$

$6x - 4 = 44$

$6x = 48$

$x = 8$

B = 25 books

$\frac{7500g}{25} = 300g$

A = 8 books

$8 \times 300g = 2400g$

2400 ..... g

(Total for Question 7 is 5 marks)

7 Becky has some marbles.
Chris has two times as many marbles as Becky.
Dan has seven more marbles than Chris.

They have a total of 57 marbles.

Dan says,
"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?
You must show how you get your answer.

Becky Chris Dan
x $2x$ $2x+7$ $= 57$

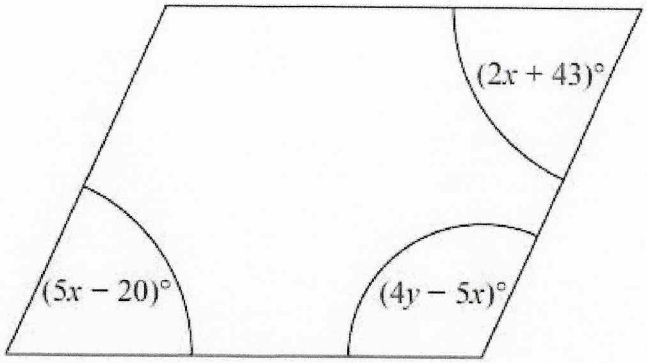
$5x + 7 = 57$
$5x = 50$
$x = 10$

Becky	Chris	Dan
10	20	27

Dan is wrong, in order to share 57, each person would need to have 19 marbles,

(Total for Question 7 is 3 marks)

8 Here is a parallelogram.



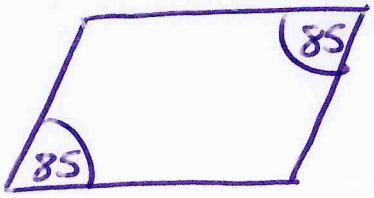
Work out the value of x and the value of y.

$2x + 43 = 5x - 20$

$43 = 3x - 20$

$63 = 3x$

$21 = x$



$4y + 5x = 95$

$4y - 5(21) = 95$

$4y - 105 = 95$

$4y = 200$

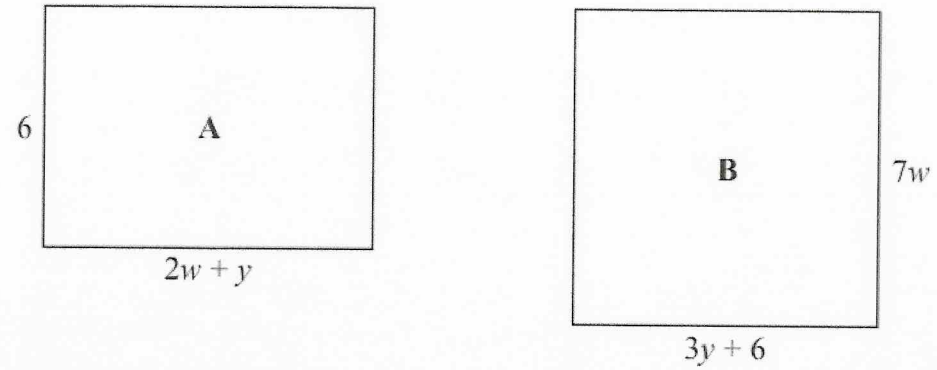
$y = 50$

$x =$ 21

$y =$ 50

(Total for Question 8 is 5 marks)

11 The diagram shows two rectangles, **A** and **B**.



All measurements are in centimetres.

The area of rectangle **A** is equal to the area of rectangle **B**.

Find an expression for y in terms of w.

Area of A

$6(2w+y) = 12w+6y$

Area of B

$7w(3y+6)$

$21wy + 42w$

$12w + 6y = 21wy + 42w$

$6y = 21wy + 30w$

$6y - 21wy = 30w$

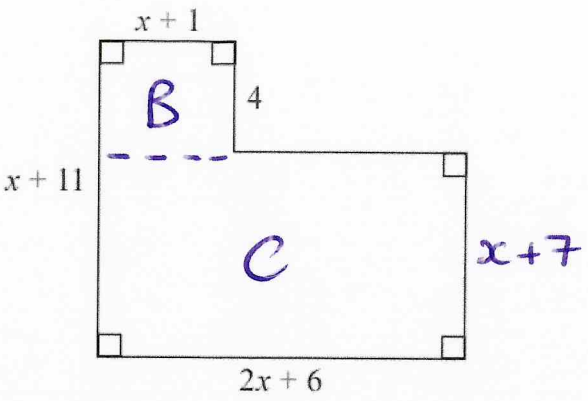
$y(6 - 21w) = 30w$

$y = \frac{30w}{6-21w}$

$y = \frac{30w}{6-21w}$

(Total for Question 11 is 4 marks)

14 Here is a shape with all its measurements in centimetres.



The area of the shape is A cm^2

Show that $A = 2x^2 + 24x + 46$

$B = 4(x+1) = 4x+4$

$C = (2x+6)(x+7) = 2x^2+6x+14x+42$

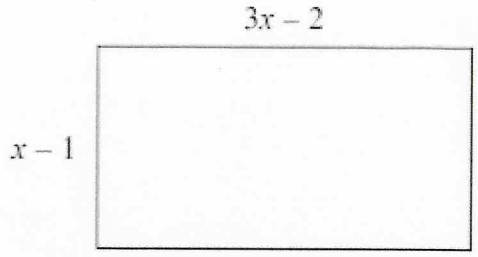
$= 2x^2+20x+42$

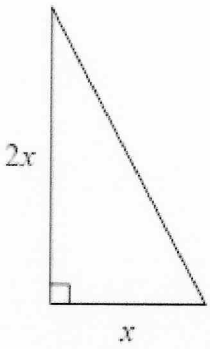
$B+C = 4x+4+2x^2+20x+42$

$= 2x^2+24x+46$

(Total for Question 14 is 3 marks)

23 Here is a rectangle and a right-angled triangle.





All measurements are in centimetres.
The area of the rectangle is greater than the area of the triangle.

Find the set of possible values of x.

Area of rectangle

$(x-1)(3x-2)$

$= 3x^2 - 3x - 2x + 2$

$= 3x^2 - 5x + 2$

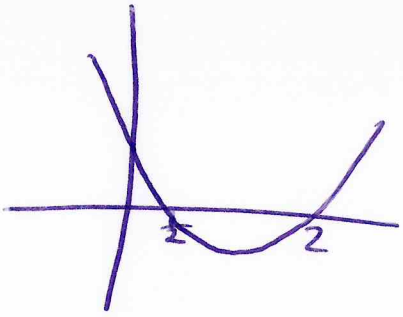
Area of triangle

$\frac{x \times 2x}{2} = \frac{2x^2}{2} = x^2$

$3x^2 - 5x + 2 > x^2$

$2x^2 - 5x + 2 > 0$

$(2x-1)(x-2) > 0$



$2x - 1 > 0$

$2x > 1$

$x > \frac{1}{2}$

$x - 2 > 0$

$x > 2$

$x > 2$

(Total for Question 23 is 5 marks)