Name ANSWERS	Class

MATHS TEACHER HUB

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Forming expressions

(9 – 1) Topic booklet

Foundation

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 **1F** question you are not allowed to use a calculator.
- If the question is a **2F** or a **3F** 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.

2 Cups are sold in packs and in boxes.

There are 12 cups in each pack.
There are 18 cups in each box.

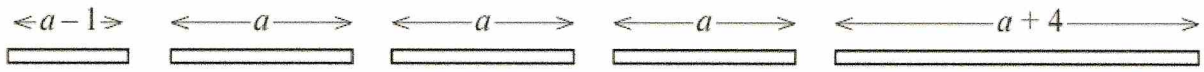
Alison buys p packs of cups and b boxes of cups.

Write down an expression, in terms of p and b, for the total number of cups Alison buys.

$12p + 18b$

June 2017 – Paper 3F **(Total for Question 2 is 2 marks)**

6 Here are five straight rods.



All measurements are in centimetres.

The total length of the five rods is L cm.

Find a formula for L in terms of a.
Write your formula as simply as possible.

$a-1 + a + a + a + a+4$

$= 5a + 3$

$L = 5a + 3$

November 2017 – Paper 1F **(Total for Question 6 is 3 marks)**

6 Michelle and Wayne have saved a total of £458 for their holiday.
Wayne saved £72 more than Michelle.

How much did Wayne save?

$x + x + 72 = 458$

$2x + 72 = 458$

$2x = 386$

$x = 193$

£ 265

Specimen 1 – Paper 2F **(Total for Question 6 is 2 marks)**

7 There are y boats on a lake.
There are 7 people in each boat.

Write an expression, in terms of y, for the total number of people in the boats.

$7y$

June 2019 – Paper 2F **(Total for Question 7 is 1 mark)**

7 David has twice as many cousins as Becky.
Becky has twice as many cousins as Nishat.

Nishat has 6 cousins.

How many cousins does David have?

D	B	N
4x	2x	x
24	12	6

24

May 2018 – Paper 3F **(Total for Question 7 is 2 marks)**

10 Rob buys p packets of plain crisps and c packets of cheese crisps.

Write down an expression for the total number of packets of crisps Rob buys.

p + c

(1)

Sample 1 – Paper 2F **(Total for Question 10 is 1 mark)**

13 The length of a line is x centimetres.

Write down an expression, in terms of x, for the length of the line in millimetres.

10x

June 2019 – Paper 1F **(Total for Question 13 is 1 mark)**

13 Azmol, Ryan and Kim each played a game.

Azmol's score was four times Ryan's score.
Kim's score was half of Azmol's score.

Write down the ratio of Azmol's score to Ryan's score to Kim's score.

A	R	K
$4x$	x	$2x$
4	1	2

4 : 1 : 2

(Total for Question 13 is 2 marks)

13 The size of the largest angle in a triangle is 4 times the size of the smallest angle.
The other angle is 27° less than the largest angle.

Work out, in degrees, the size of each angle in the triangle.
You must show your working.

x, $4x$, $4x-27$ $= 180$

$9x - 27 = 180$

$9x = 153$

$x = 17°$

17 °, 68 °, 41 °

June 2017 – Paper 3F

(Total for Question 13 is 5 marks)

14 There are x sweets in a box.

There are y sweets in a packet.

Write an expression, in terms of x and y, for the total number of sweets in 3 boxes and 2 packets.

$3x + 2y$

(2)

November 2022 – 2F

(Total for Question 14 is 2 marks)

16 (a) Simplify $m \times m \times m \times m$

m^4

(1)

In a competition, a player gets

5 points for each game they win
2 points for each game they draw
0 points for each game they lose.

Amy wins x games and draws y games.

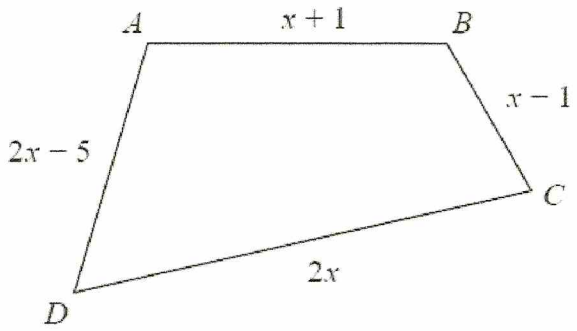
(b) Write down an expression, in terms of x and y, for the total number of points Amy gets.

$T = 5x + 2y$

(2)

(Total for Question 16 is 3 marks)

16 Here is a quadrilateral $ABCD$.



All the measurements are in centimetres.

The perimeter of $ABCD$ is 52 centimetres.

Work out the length of DC.

$2x-5 + x+1 + x-1 + 2x = 52$

$6x - 5 = 52$

$6x = 57$

$x = 9.5$

$DC = 2x$

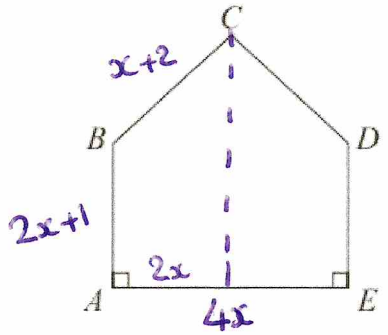
$= 2 \times 9.5$

$= 19$

19 centimetres

(Total for Question 16 is 4 marks)

17 The diagram shows a pentagon.
The pentagon has one line of symmetry.

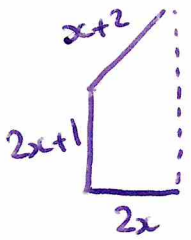


$AE = 4x$
$AB = 2x + 1$
$BC = x + 2$

All these measurements are given in centimetres.

The perimeter of the pentagon is 18 cm.

(a) Show that $10x + 6 = 18$



$= 5x + 3 \longrightarrow$ doubled $= 10x + 6$

$10x + 6 = 18$

(3)

(b) Find the value of x.

$10x + 6 = 18$

$10x = 12$

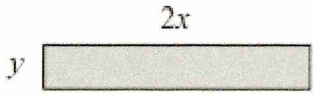
$x = 1.2$

$x =$ 1.2

(2)

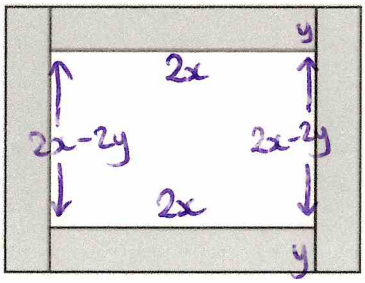
(Total for Question 17 is 5 marks)

17 Here is a rectangle made of card.



The measurements in the diagram are in centimetres.

Lily fits four of these rectangles together to make a frame.



The perimeter of the inside of the frame is P cm.

(a) Show that $P = 8x - 4y$

$2x-2y + 2x + 2x-2y + 2x = 8x - 4y$

(2)

Magda says,

"When x and y are whole numbers, P is always a multiple of 4."

(b) Is Magda correct?
You must give a reason for your answer.

Magda is correct, multiples of 8 and 4 are always multiples of 4.

(2)

(Total for Question 17 is 4 marks)

18 Naomi has b bags of apples and c crates of apples.

There are 5 apples in each bag.
There are 28 apples in each crate.

Naomi has a total of T apples.

Write a formula for T in terms of b and c.

$T = 5b + 28c$

(Total for Question 18 is 3 marks)

18 Ben is n years old.
Chloe is twice as old as Ben.
Dan is five years younger than Ben.

The total of Ben's age, Chloe's age and Dan's age is T years.

(a) Find a formula for T in terms of n.

B C D
n 2n n-5

$T = 4n - 5$

(3)

(b) In the table below, put a tick (✓) in the box next to the identity.

$3h + 2 = 14$	
$3a + 4b - 2c$	
$A = \pi r^2$	
$5m - 3m = 2m$	✓
$x + 7 \leqslant 12$	

(1)

(Total for Question 18 is 4 marks)

18 Dimitar has 20 sweets.
Pip also has 20 sweets.

Dimitar gives Pip x sweets.

Dimitar then eats 5 of his sweets.
Pip then eats half of her sweets.

Write expressions for the number of sweets Dimitar and Pip now have.

Dimitar
$20 - x - 5$

Pip
$\frac{20-x}{2}$

Dimitar $15-x$ Pip $\frac{20-x}{2}$

Specimen 2 – Paper 1F **(Total for Question 18 is 3 marks)**

19 Adam, Linda and Rytis share an amount of money.

Linda gets three times as much money as Rytis gets.
Linda gets half as much money as Adam gets.

What fraction of the amount of money does Linda get?

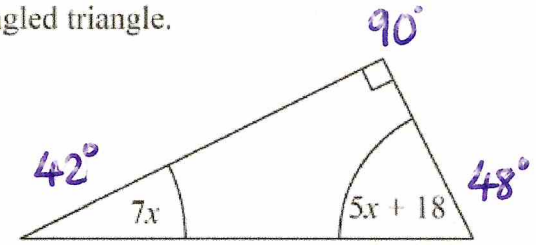
A L R
$6x$ $3x$ x $= 10x$

$\frac{3x}{10x}$

$\frac{3}{10}$

May 2020 – Paper 2F **(Total for Question 19 is 2 marks)**

20 The diagram shows a right-angled triangle.



All the angles are in degrees.

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

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

$12x + 108 = 180$

$12x = 72$

$x = 6$

42 °

(Total for Question 20 is 3 marks)

24 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	$2x$	$2x-6$	$= 54$

$5x - 6 = 54$

$5x = 60$

$x = 12$

Rick	Selma	Tony
12	24	18

Rich : Tony

$12 : 18$

$\div 12$

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

$1 : 1.5$

$p =$ 1.5

June 2022 – Paper 3F **(Total for Question 24 is 5 marks)**

24 Kiaria is 7 years older than Jay.
Martha is twice as old as Kiaria.
The sum of their three ages is 77

Find the ratio of Jay's age to Kiaria's age to Martha's age.

K	J	M	
$x+7$	x	$2(x+7)$	$= 77$
		$= 2x+14$	

$4x + 21 = 77$

$4x = 56$

$x = 14$

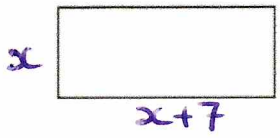
Kiara	Jay	Marth
21	14	42

$14 : 21 : 42$

$2 : 3 : 6$

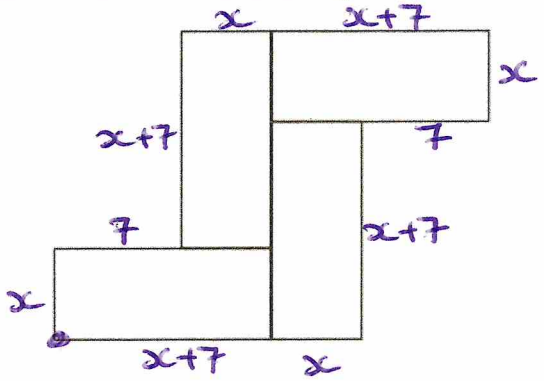
November 2017 – Paper 1F **(Total for Question 24 is 4 marks)**

24 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.



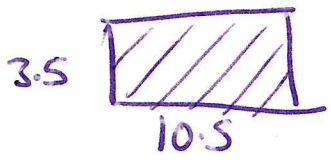
The perimeter of the 8-sided shape is 70 cm.

Work out the area of the 8-sided shape.

$8x + 42 = 70$

$8x = 28$

$x = 3.5$



Area $= 3.5 \times 10.5$

$= 36.75 cm^2$

$\times 4$

$= 147 cm^2$

147 ..... cm^2

(Total for Question 24 is 5 marks)

26 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.

B	C	D	
x	$2x$	$2x+7$	$= 57$

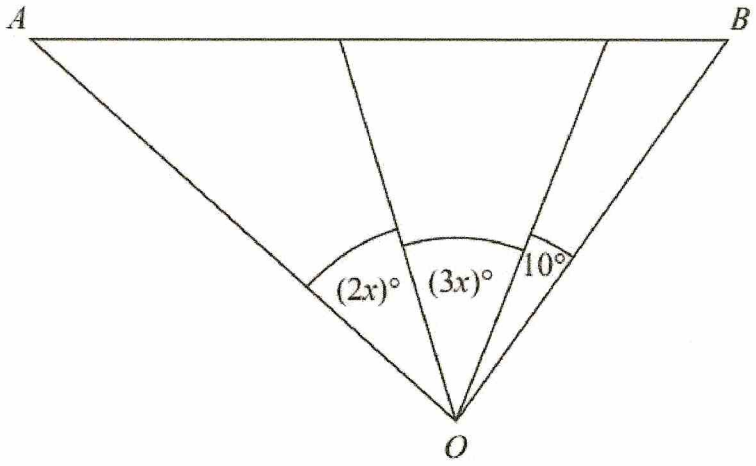
$$5x + 7 = 57$$
$$5x = 50$$
$$x = 10$$

Becky	Chris	Dan
10	20	27

No Dan is wrong, if he gives 7 to Becky she wont have 20 like Chris and Dan

(Total for Question 26 is 3 marks)

28 The diagram shows triangle AOB.



Angle AOB is **not** an obtuse angle.

Find the greatest value of x.
You must show all your working.

$2x + 3x + 10 \leqslant 90^\circ$

$5x + 10 \leqslant 90$

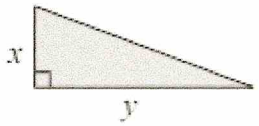
$5x \leqslant 80$

$x \leqslant 16$

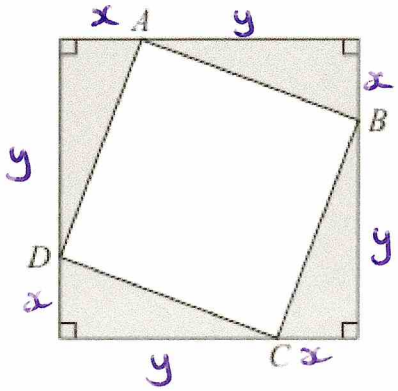
16°

(Total for Question 28 is 3 marks)

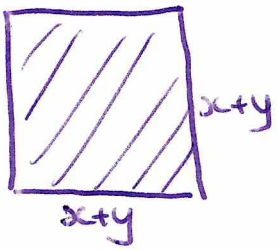
28 Here is a right-angled triangle.

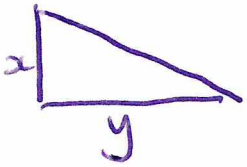


Four of these triangles are joined to enclose the square $ABCD$ as shown below.



Show that the area of the square $ABCD$ is $x^2 + y^2$





$(x+y)(x+y)$

$= x^2 + 2xy + y^2$

$\frac{y \times x}{2} = \frac{xy}{2}$

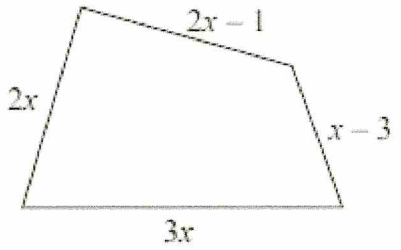
$\times 4 = \frac{4xy}{2}$

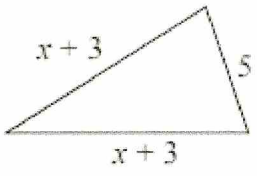
$= 2xy$

 (Total for Question 28 is 3 marks)

$x^2 + 2xy + y^2 - 2xy = x^2 + y^2$

30





In the diagram all measurements are in centimetres.

The perimeter of the quadrilateral is twice the perimeter of the triangle.

Work out the perimeter of the quadrilateral.

$2x + 2x - 1 + x - 3 + 3x$ | $x+3 + 5 + x+3$

$= 8x - 4$ | $2x + 11$

Double this

$8x - 4 = 4x + 22$

$4x - 4 = 22$

$4x = 26$

$x = 6.5$

48 cm

Specimen 2 – Paper 3F **(Total for Question 30 is 4 marks)**

$8(6.5) - 4$