

Please write clearly in block capitals.

Centre number       Candidate number

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

## GCSE MATHEMATICS

# F

Foundation Tier Paper 3 Calculator

Tuesday 13 June 2017

Morning

Time allowed: 1 hour 30 minutes

### Materials

For this paper you must have:

- a calculator
- mathematical instruments.



### Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

For Examiner's Use	
Pages	Mark
2-3	
4-5	
6-7	
8-9	
10-11	
12-13	
14-15	
16-17	
18-19	
20-21	
22-23	
24-25	
<b>TOTAL</b>	

### Advice

- In all calculations, show clearly how you work out your answer.



Answer all questions in the spaces provided

- 1 Circle the lowest of these temperatures.

[1 mark]

 $-4.9^{\circ}\text{C}$  $0^{\circ}\text{C}$  $-7^{\circ}\text{C}$  $0.1^{\circ}\text{C}$ 

- 2 Circle the expression that is four times bigger than
- $n$
- .

[1 mark]

 $n + 4$  $4n$  $\frac{n}{4}$  $n^4$ 

- 3 Circle the fraction greater than
- $\frac{3}{10}$

[1 mark]

 $\frac{1}{3}$  $\frac{3}{11}$  $\frac{4}{15}$  $\frac{29}{100}$ 

$$\frac{3}{10} = 0.3, \quad \frac{1}{3} = 0.333\dots > 0.3$$



4 Circle the value of  $2^5$ 

[1 mark]

10

25

32

64

5 (a) Simplify  $a \times a \times a + b + b$ 

BIDMAS

[2 marks]

$$a \times a \times a = a^3$$

$$a^3 + b + b = a^3 + 2b$$

Answer  $a^3 + 2b$

5 (b) Simplify  $5(x+3) - x + 2$ 

[3 marks]

$$5(x+3) - x + 2$$

$$= 5x + 15 - x + 2$$

$$= 5x - x + 15 + 2 = 4x + 17$$

Answer  $4x + 17$

Turn over for the next question

Turn over ►



- 6 Twelve cards numbered 1 to 12 are put into six pairs.  
Each pair has a total.

Complete the table to show the pairs and their totals.

[4 marks]

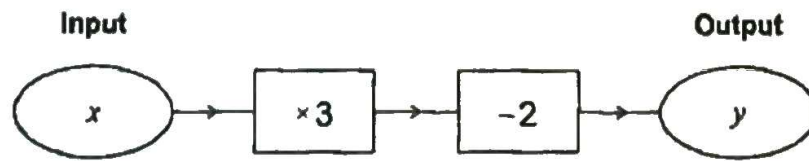
Cards	Total
1 and 2	3
<u>3</u> and <u>6</u>	9
<u>4</u> and <u>7</u>	11
<u>5</u> and <u>9</u>	14
<u>8</u> and <u>11</u>	19
<u>10</u> and <u>12</u>	22

9: 3 AND 6, ~~4 AND 5~~  
 11: ~~3 AND 8~~, 4 AND 7, ~~5 AND 6~~  
 14: ~~3 AND 11~~, ~~4 AND 10~~, 5 AND 9, ~~6 AND 8~~  
 19: 8 AND 11, ~~9 AND 10~~, ~~7 AND 12~~  
 22: 10 AND 12

~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~ ~~10~~ ~~11~~ ~~12~~



7 Here is a number machine.



7 (a) Work out the output when the input is 4

[1 mark]

$$4 \times 3 = 12$$

$$12 - 2 = 10$$

Answer

10

7 (b) Work out the output when the input is  $-4$

[1 mark]

$$(-4) \times 3 = -12$$

$$(-12) - 2 = -14$$

Answer

-14

Turn over for the next question

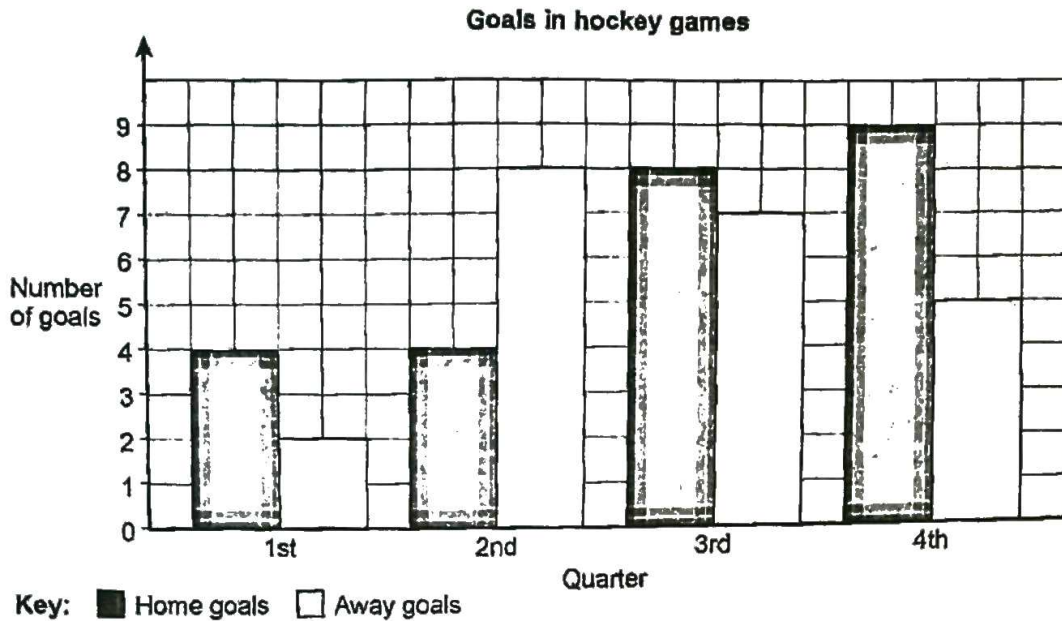
Turn over ►





8

Here is information about the goals scored in some hockey games.  
Each game has four quarters.



- 8 (a) Which quarter was the mode for away goals?  
Circle your answer.

[1 mark]

1st

2nd

3rd

4th

- 8 (b) There were 10 games.

Work out the mean number of goals per game.

[2 marks]

$$4 + 2 + 4 + 8 + 8 + 7 + 9 + 5 = 47$$

$$\frac{47}{10} = 4.7$$

Answer 4.7



06

MATHS MADE EASY

8 (c) In total, how many more home goals were scored than away goals?

[2 marks]

$$\text{HOME: } 4 + 4 + 8 + 9 = 25$$

$$\text{AWAY: } 2 + 8 + 7 + 5 = 22$$

$$25 - 22 = 3$$

Answer 3

8 (d) Rob says,

"More home teams must have won because there were more home goals."

Is he correct?

Give a reason for your answer.

[1 mark]

NO. IT IS POSSIBLE FOR A TEAM TO SCORE  
5 GOALS IN ONE GAME AND LOSE, WHILST ANOTHER  
TEAM MAY SCORE ONLY ONE GOAL AND WIN. (GOALS  
SCORED AREN'T ENTIRELY REFLECTIVE OF THE OUTCOME)

6

Turn over ►



9 (a) List all the factors of 30

[2 marks]

$$1 \times 30, 2 \times 15, 3 \times 10, 5 \times 6$$

Answer 1, 2, 3, 5, 6, 10, 15, 30

9 (b) A factor of 30 is chosen at random.

What is the probability that it is a 2-digit number?

[1 mark]

$$10, 15, \text{ OR } 30, \Rightarrow \frac{3}{8}$$

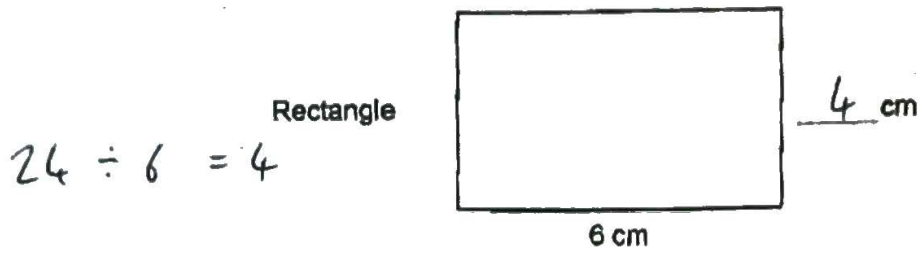
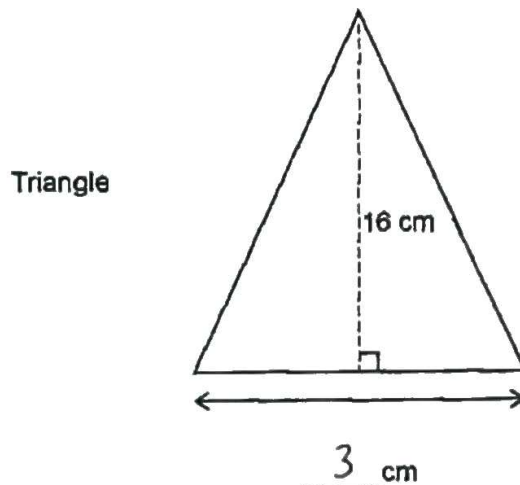
Answer  $\frac{3}{8}$





- 10 Each shape below has an area of  $24 \text{ cm}^2$   
Complete the missing lengths.

[3 marks]

Not drawn  
accurately

$$A = \frac{1}{2}bh$$

$$\Rightarrow 24 = \frac{1}{2} \times b \times 16$$

$$\Rightarrow 24 = 8b$$

$$\Rightarrow b = \frac{24}{8} = 3$$

Turn over for the next question

6
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Turn over ►



- 11 A television channel shows 12 minutes of adverts in each half hour.  
How many minutes of adverts does it show from 5 am to 11 pm?

[3 marks]

$$5 \text{ am TO } 11 \text{ pm} \Rightarrow 18 \text{ HOURS}$$

$$12 \text{ MINUTES PER HALF HOUR} \Rightarrow 24 \text{ MINUTES PER HOUR}$$

$$18 \times 24 = 432 \text{ MINUTES}$$

Answer 432 minutes

- 12 Put these probabilities in order, starting with the least likely.

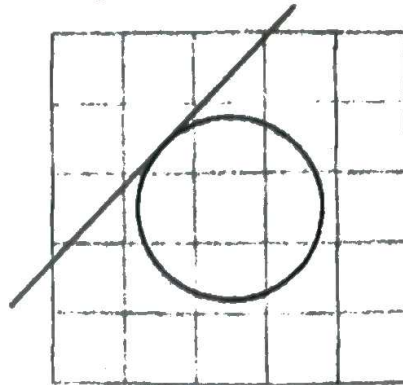
44%	$\frac{1}{4}$	0.404	$\frac{4}{10}$
0.44	0.25	0.404	0.4

[2 marks]

Answer  $\frac{1}{4}$  ,  $\frac{4}{10}$  , 0.404 , 44%



- 13 A circle is drawn on a centimetre grid.



- 13 (a) Draw a tangent to the circle.

[1 mark]

- 13 (b) Grace works out that the area of the circle is more than  $9 \text{ cm}^2$

Why must this be wrong?

[1 mark]

THE CIRCLE IS CONTAINED WITHIN A 3 BY 3 SQUARE,  
AND THE AREA OF THIS SQUARE IS  $3 \times 3 = 9 \text{ cm}^2$ .  
AS THE CIRCLE IS INSIDE THIS SQUARE, ITS AREA  
MUST BE LESS THAN  $9 \text{ cm}^2$

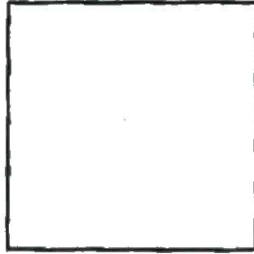
Turn over for the next question

7

Turn over ►



- 14 (a) The front elevation, side elevation and plan of a solid are all the same, as shown.

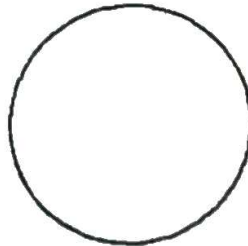


Write down the name of the solid.

[1 mark]

Answer CUBE

- 14 (b) The front elevation, side elevation and plan of a solid are all the same, as shown.



Write down the name of the solid.

[1 mark]

Answer SPHERE



18

Show that there are exactly five 3-digit cube numbers.

(3 marks)

$$1^3 = 1$$

$$2^3 = 8$$

$$3^3 = 27$$

$$4^3 = 64$$

$$5^3 = 125 \text{ (1)}$$

$$6^3 = 216 \text{ (2)}$$

$$7^3 = 343 \text{ (3)}$$

$$8^3 = 512 \text{ (4)}$$

$$9^3 = 729 \text{ (5)}$$

$$10^3 = 1,000$$

AFTER  $10^3$ , NUMBER OF DIGITS

MUST NOT DECREASE, SO THE

5 COUNTED HERE ARE THE

ONLY 5.

Turn over for the next question

5

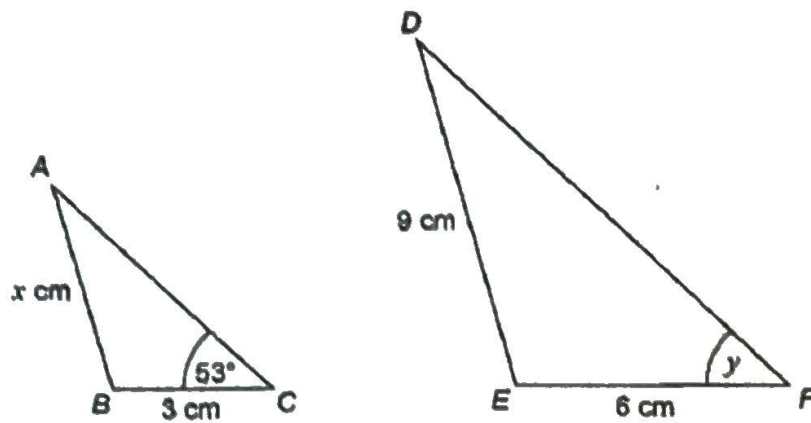
Turn over ►



1 3



16

Triangles  $ABC$  and  $DEF$  are similar.Not drawn  
accurately16 (a) Work out the value of  $x$ .

[2 marks]

$$\frac{x}{9} = \frac{3}{6}$$

$$\Rightarrow x = 9 \times \frac{3}{6} = 9 \times \frac{1}{2} = 4.5\text{ cm}$$

Answer

4.5 cm

16 (b) Write down the size of angle  $y$ .

[1 mark]

Answer

53

degrees



17  $CD$  and  $PQ$  are lines of length 12 cm

17 (a)  $CE : CD = 1 : 2$

Mark point  $E$  on the line with a cross.

[1 mark]



$$4 : 8 = 1 : 2$$

17 (b)  $PR : RQ = 1 : 3$

Mark point  $R$  on the line with a cross.

[1 mark]



$$1 : 3 = 3 : 9$$

Turn over for the next question

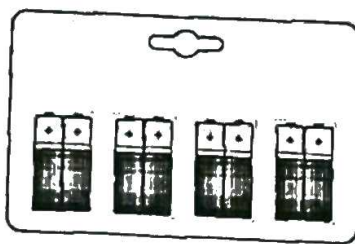
5
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Turn over ►

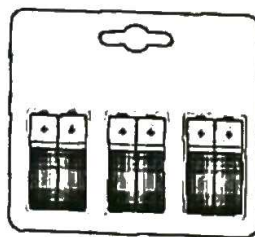


18

A shop sells two brands of battery.



Brand A  
Pack of 8  
Price £3.60



Brand B  
Pack of 6  
Price £2.94

One brand A battery powers a toy for 5 hours.

One brand B battery powers the same toy for  $5\frac{1}{2}$  hours.

Which brand is better value?

You must show your working.

[5 marks]

$$\text{BRAND A: } 8 \times 5 = 40 \text{ HOURS}$$

$$\frac{40}{3.60} = 11.1 \text{ HOURS PER POUND}$$

$$\text{BRAND B: } 6 \times 5.5 = 33 \text{ HOURS}$$

$$\frac{33}{2.94} = 11.22 \text{ HOURS PER POUND}$$

(2d.p.)

$11.22 > 11.1$ , so BRAND B IS BETTER VALUE

Answer BRAND B



- 19 The value of  $x$  can be 2 or 5  
The value of  $y$  can be 3 or 12

- 19 (a) List the possible values of  $xy$

[2 marks]

$$2 \times 3 = 6, \quad 2 \times 12 = 24,$$

$$5 \times 3 = 15, \quad 5 \times 12 = 60$$

Answer 6, 15, 24, 60

- 19 (b) Work out the least possible value of  $\frac{x-y}{x}$

You must show your working.

[2 marks]

$$x - y: \quad 2 - 3 = -1, \quad 2 - 12 = \textcircled{-10} \quad \swarrow \text{LOWEST} \quad 5 - 3 = 2, \quad 5 - 12 = -7$$

$$x: \quad 2, \quad 5 \Rightarrow \frac{x-y}{x} = \frac{-10}{2} = \textcircled{-5} \quad \text{OR} \quad \frac{-10}{5} = -2$$

↑  
LOWEST POSSIBLE

Answer -5

Turn over for the next question

Turn over ►



20

An exam has two papers.

Anil scores

33 out of 60 on paper 1

and

75 out of 100 on paper 2

Work out his percentage score for the exam.

[3 marks]

$$\frac{33 + 75}{60 + 100} = \frac{108}{160} = 0.675$$

$$0.675 \times 100 = 67.5$$

67.5 %

Answer 67.5 %





21

Purple paint is made by mixing red paint and blue paint in the ratio 5 : 2  
Yan has 30 litres of red paint and 9 litres of blue paint.

What is the maximum amount of purple paint he can make?

[3 marks]

$$5 : 2 \xrightarrow{\times 6} = 30 : 12, \text{ SO TO USE ALL 30 LITRES}$$

OF RED PAINT WE WOULD NEED 12 LITRES OF BLUE.

INSTEAD, CONSIDER USING ALL 9 LITRES OF BLUE:

$$\begin{array}{l} \times 4.5 \downarrow 5 : 2 \\ 22.5 : 9 \end{array} \times 4.5 \quad 22.5 + 9 = 31.5$$

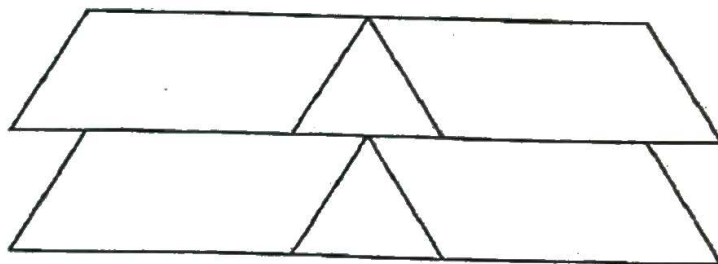
Answer 31.5 litres

Turn over for the next question

Turn over ►



- 22 This shape is made from two triangles and four congruent parallelograms.



Not drawn  
accurately

For each statement, tick the correct box.

- 22 (a) The triangles are equilateral.

[1 mark]

Must be true

Could be true

Must be false

- 22 (b) The triangles are congruent.

[1 mark]

Must be true

Could be true

Must be false



23 (a) The length of a pipe is 6 metres to the nearest metre.

Complete the error interval for the length of the pipe.

[2 marks]

Answer 5.5 m < length < 6.5 m

23 (b) The length of a different pipe is 4 metres to the nearest metre.

Ollly says,

"The total length of the two pipes is 11 metres to the nearest metre."

Give an example to show that he could be correct.

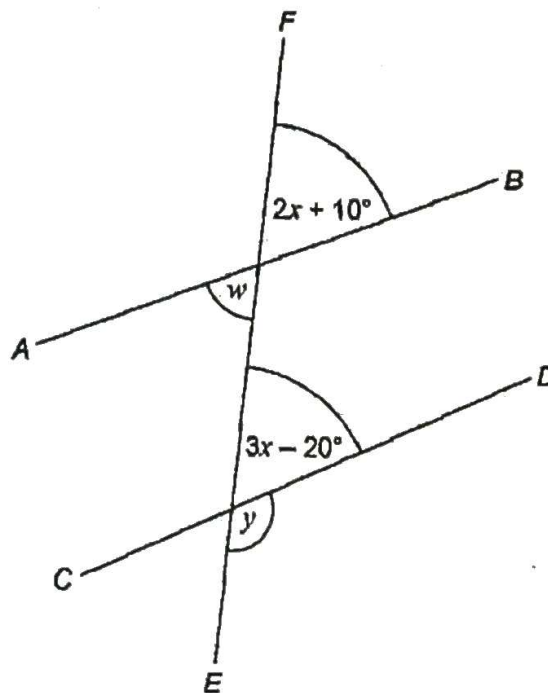
[2 marks]

$$\begin{array}{l} \text{PIPE 1: } 6.3 \text{ m} \\ \text{PIPE 2: } 4.3 \text{ m} \end{array} \left. \vphantom{\begin{array}{l} \text{PIPE 1: } 6.3 \text{ m} \\ \text{PIPE 2: } 4.3 \text{ m} \end{array}} \right\} 6.3 + 4.3 = 10.6 \text{ m} = 11 \text{ m} \\ \text{(TO NEAREST METRE)}$$

Turn over for the next question



- 24 AB, CD and EF are straight lines.



Not drawn  
accurately

- 24 (a) Ava assumes that AB and CD are parallel.

What answer should she get for the size of angle  $y$ ?

[4 marks]

CORRESPONDING ANGLES:		$2x + 10 = 3x - 20$
$+10$		$2x + 30 = 3x$
$-2x$		$30 = x$
$x = 30 \Rightarrow 3x - 20$		
		$= (3 \times 30) - 20 = 70^\circ$

$$y = 180 - 70 = 110$$

Answer 110 degrees



24 (b) In fact,

AB and CD are not parallel

angle  $w$  is  $60^\circ$ What effect does this have on the size of angle  $y$ ?

Tick a box.

 $y$  is bigger $y$  is the same $y$  is smaller

Show working to support your answer.

[3 marks]

$$\begin{array}{r|l} \text{OPPOSITE ANGLES 1} & (w =) \\ \hline & 60 = 2x + 10 \\ -10 & \hline & 50 = 2x \\ \div 2 & \hline & 25 = x \\ & \hline & \end{array} \quad \begin{array}{l} \\ -10 \\ \hline \\ \div 2 \\ \hline \end{array}$$

$$x = 25 \Rightarrow 3x - 20 = 3(25) - 20 = 55$$

$$\therefore y = 180 - 55 = 125 > 110$$

Turn over for the next question

7

Turn over ►





25 There are 720 boys and 700 girls in a school.

The probability that a boy chosen at random studies French is  $\frac{2}{3}$

The probability that a girl chosen at random studies French is  $\frac{3}{5}$

25 (a) Work out the number of students in the school who study French.

[3 marks]

$$\frac{2}{3} \times 720 = 480$$

$$\frac{3}{5} \times 700 = 420$$

$$480 + 420 = 900$$

Answer 900

25 (b) Work out the probability that a student chosen at random from the whole school does not study French.

[2 marks]

$$(720 + 700) - 900 = 520 \text{ DON'T STUDY FRENCH}$$

$$\frac{520}{(720+700)} = \frac{26}{71}$$

Answer  $\frac{26}{71}$



26

Circle the expression equivalent to  $x^2 - 4x - 12$ 

[1 mark]

$(x-4)(x-8)$

$(x+3)(x-4)$

$(x-12)(x+1)$

$(x+2)(x-6)$

$$2 + (-6) = -4, \quad 2 \times (-6) = -12$$

27

How are the whole number solutions to A and B different?

A      Solve  $3 < 3x < 18$

B      Solve  $3 < 3x < 18$

[2 marks]

$$A: 3x = 3, 4, 5, 6, \dots, 15, 16, 17$$

$$B: 3x = 4, 5, 6, \dots, 15, 16, 17, 18$$

$$\text{FOR A: } 3x = 3 \Rightarrow x = 1, \text{ NOT IN B}$$

$$\text{FOR B: } 3x = 18 \Rightarrow x = 6, \text{ NOT IN A}$$

THE REST OF THE WHOLE NUMBER SOLUTIONS  
ARE IN BOTH A AND B

END OF QUESTIONS

