

Name .....

School .....

## Winchester Entrance and Election

### **Mathematics I**

Thursday 4th May 2023

Time allowed: 1 hour 30 minutes

Total marks: 100

**CALCULATORS ARE NOT ALLOWED.**

Write your answers in this booklet. If you need additional space, please write on sheets of A4 paper and attach them to this booklet. You should show all your working so that credit may be given for partly correct answers.

Diagrams are not drawn to scale.

*Do not be discouraged if you do not finish.* If you get more than 60 marks you will have done well.



<b>3.</b>	Calculate: a) $6419 - (6419 - 21) =$	b) $\frac{98 + 99 + 100 + 101 + 102}{5} =$	[1] [1]
	c) $(\sqrt{225})^2 =$	d) $12 \div 0.5 =$	[1] [1]
	e) $\sqrt{8100} =$	f) $\frac{30 \times 512}{3} - 13 =$	[2] [2]

4. Find in the simplest form:

a)  $2\frac{13}{19} - \frac{17}{19}$

b)  $2\left(\frac{1}{8} + \frac{1}{4}\right)$

[2]  
[2]

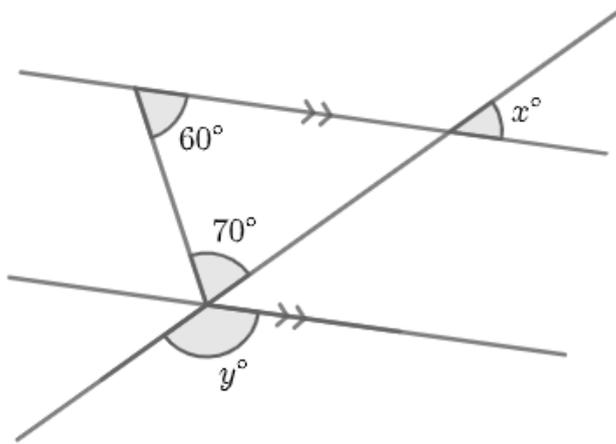
c)  $\frac{1 + \frac{1}{2}}{1 - \frac{1}{4}}$

d)  $\frac{34}{57} \times \frac{38}{161} \div \frac{4}{21}$

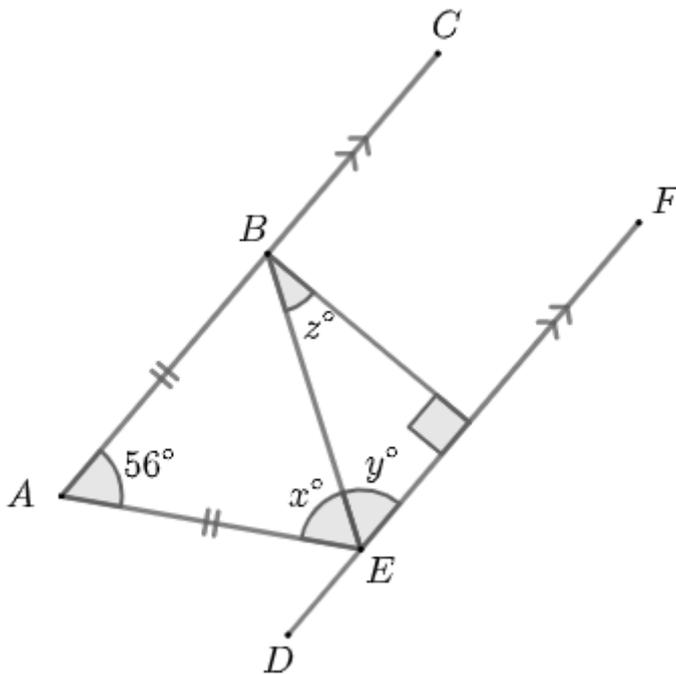
[2]  
[3]

5.	a) Simplify the ratio 72:54 .	b) Divide 35 in the ratio 5:2 leaving your answer in the form $a:b$ .	[2] [2]
	c) Evaluate $\sqrt{\frac{64}{16}}$ .	d) Evaluate $\frac{\sqrt[3]{4 \times 6 \times 9}}{\sqrt{20 \times 6 \times 30}}$ .	[2] [3]
	e) Estzer knows that it will take her five employees eight days to complete a project, but two of these employees are ill and cannot work. Show that she still has enough employees to complete this project in fewer than two weeks.		[3]

6. a) The diagram below shows four lines, two of which are parallel. Find  $x$  and  $y$ . [2]



b) In the diagram below  $ABC$  and  $DEF$  are parallel lines.  $AB$  and  $AE$  are the same length. Find  $x$ ,  $y$  and  $z$ . [3]



7.	$a = 7, b = -13, c = 10$ and $d = -2$ . Find the value of:  a) $\frac{a - b}{c}$	b) $ac + bd$	[1] [1]
	c) $(c + a)(c - a)$	d) $\frac{c^2 - d^3}{c - d}$	[1] [2]
	e) $\frac{3a + 3(b + c) + 3d}{a + b + c + d}$		[2]

8.

a) Solve  $7x - 9 = 47$ .

b) Solve  $\frac{92}{2x + 1} = -4$ .

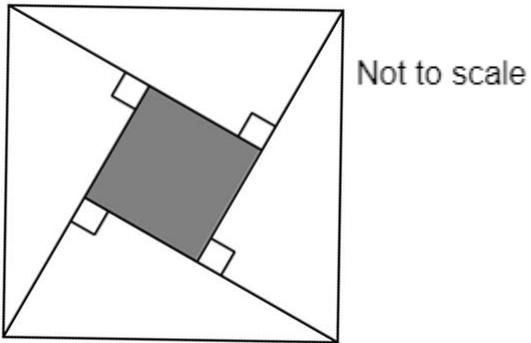
[1]  
[2]

c) Solve  $\sqrt{5\left(\frac{5x+5}{5}\right) + 5 + \frac{5}{5}} = 6$ . Show all your working.

[3]

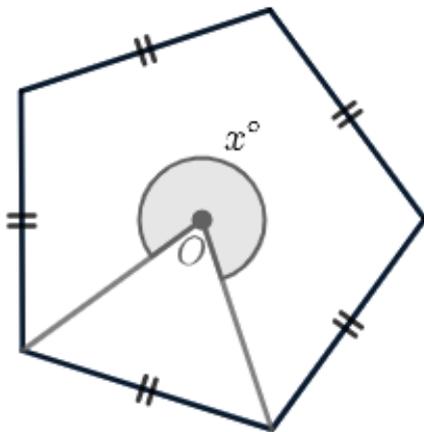
9. a) In the diagram below, the hypotenuse of each of the four right-angled triangles has length 25 and is the side of a square. The shortest side of each of these right-angled triangles has length 15. Find the shaded area.

[4]



- b) In the regular pentagon below  $O$  is the centre. Find the reflex angle  $x$ .

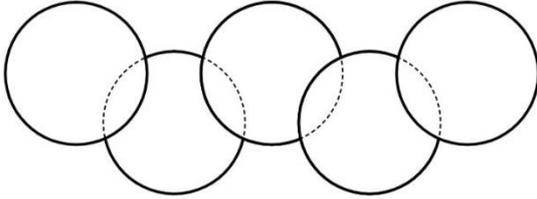
[3]



<b>10.</b>	a) Mr McMathma's class of five pupils had a mean score of four out of ten on their latest mathematics test. A pupil joins the class from Dr Cawnish's set and his score brings the class' mean score up to five out of ten. What was that new pupil's score? You must show detailed reasoning.	[3]
	b) A solid box has dimensions 10 cm by 5 cm by 8 cm. A cube of side length 2 cm is removed from each corner. What percentage of the box remains?	[3]
	c) Winchester Worldies Football Club needs to buy socks and T-shirts for its members. Socks cost £4 per pair and T-shirts are £5 more than a pair of socks. Each member needs two pairs of socks and a T-shirt. The club manager puts pays £391. How many members are there in the club?	[3]

**11.** The five circles below each have an area of  $1 \text{ cm}^2$  and the sections where two circles overlap each have an area of  $\frac{1}{8} \text{ cm}^2$ .

a) What is the total area enclosed by the circles?



[2]

b) If the radius of each circle is enlarged by a scale factor of 100, how many times larger would the area of the entire shape be?

[1]

**12.** Ada, Blaise, Carl and David are given a collection of marbles to share between them. Ada takes  $\frac{1}{7}$  of the marbles. Blaise then takes  $\frac{1}{5}$  of the remaining marbles. From those marbles that now remain, Carl then takes  $\frac{1}{3}$  of them. David is left with 32 marbles. How many marbles did Ada take?

[4]

**13.** Each member of a family has the same number of children as they have siblings. For example, Alan has five siblings and also has five children.

a) How many grandchildren does Alan have?

[1]

b) Bob has six great-grandchildren. How many siblings does he have?

[2]

c) Clare has four siblings. How many descendants does she have?

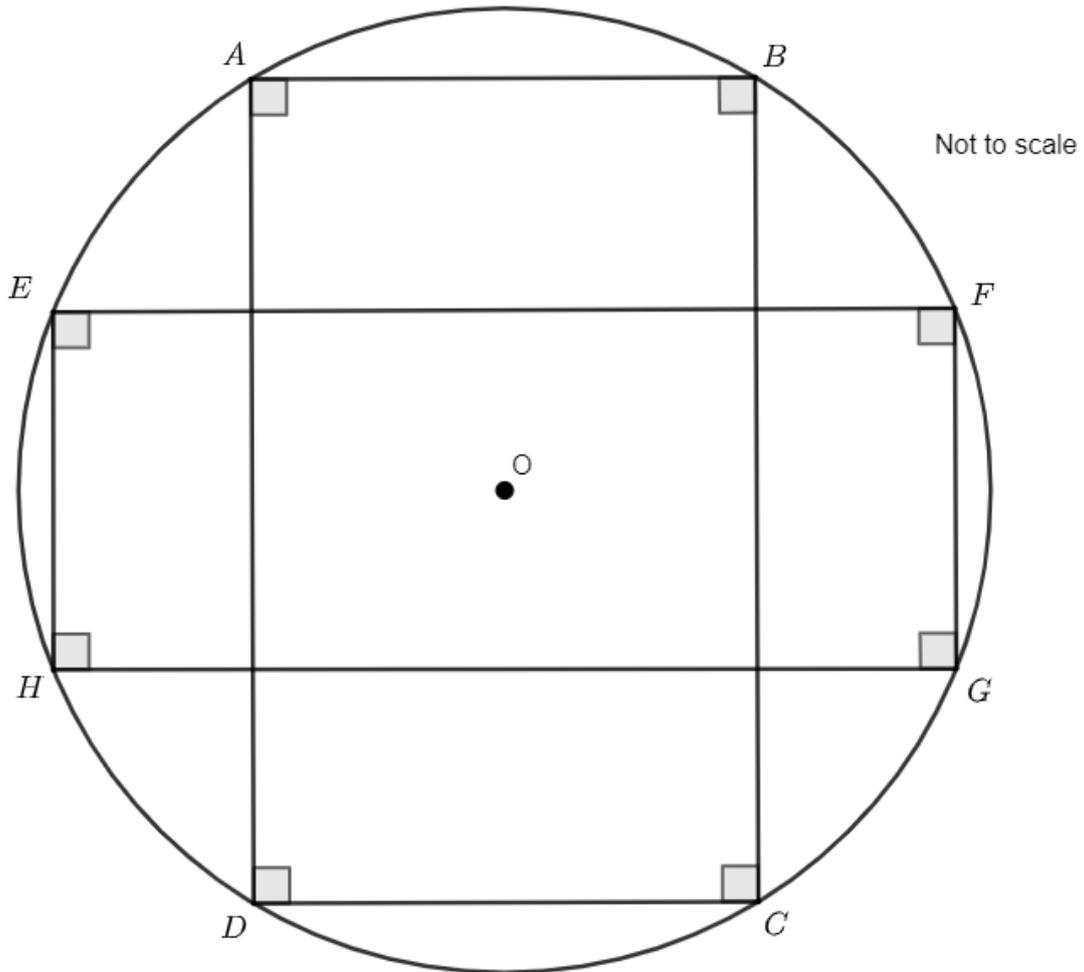
[3]

**14.** Dominic gets up every day at 0700 to head to work. If he drives at an average speed of 40 mph then he is late by three minutes. If he drives at an average speed of 60 mph then he is early by three minutes. What must be Dominic's average speed in order that he gets to work on time?

[5]

<b>15.</b>	a) Find the prime factorisation of 924.	[2]
	b) Sanjiv multiplies 924 by a positive whole number. The result is a square. What is the smallest number Sanjiv could have used?	[2]
	c) How many zeros are in $24^{24} \times 25^{25}$ when it is written as an ordinary number?	[3]

16.



$ABCD$  and  $EFGH$  are rectangles on the circumference of the circle with centre  $O$ .  
 $AB = 10$  cm,  $AD = 11$  cm and  $EH = 5$  cm.

Find the area of the rectangle  $EFGH$ .

[5]