Mill Hill School

Mathematics

Entrance Examination Specimen Paper

Time: 1 hour 30 minutes

Materials required for examination

ruler graduated in centimetres and millimetres
protractor
compasses
pen
pencil
eraser

Information for Candidates

The paper consists of two sections, A and B. Try to answer as many questions as possible from both sections. The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). There are 26 questions in this question paper, 22 in section A and 4 in section B. The total mark for this paper is 80. **Calculators must not be used**.

Advice to Candidates

Show all stages in any calculations. Work steadily through the paper. Do not spend too long on one question. If you cannot answer a question, leave it and attempt the next one. Return at the end to those you have left out.

SECTION A

Answer ALL TWENTY TWO questions.

Write your answers in the spaces provided.

1. I am thinking of a number.

My number **multiplied by** 36 is 612

My number **multiplied by** 38 is 646

What is my number?

.....

(Total 2 marks)

2. Solve these equations.

$3y + 4 = 25$

.....

(1)

$10 + 4y = 7y - 8$

.....

(2)

(Total 3 marks)

3. Work out.

$342 \times 27 =$

.....

(Total 2 marks)

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4. The table shows some percentages of amounts of money.

	£5	£30	£45
5%	25p	£1.50	£2.25
10%	50p	£3	£4.50

You can use the table to help you work out missing numbers.

15% of £30 is = £ ____

£6.75 = 15% of £ ____

£1.75 = ……% of £5

75p = 5% of £ ____

(Total 4 marks)

5. Amy, Bob and Carl each have a bag with counters. They do not know how many counters are in each bag. They know that

> Bob has **three more** counters than Amy
>
> Carl has **five times as many** counters as Amy

(a) Amy calls the number of counters in her bag ***a***.

Write **expressions using *a*** to show the number of counters in Bob's bag and in Carl's bag.





Amy: ***a*** | Bob: | Carl:

(1)

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(b) Bob calls the number of counters in his bag ***b***.

Write **expressions using *b*** to show the number of counters in Amy's bag and in Carl's bag.



Amy:	Bob: ***b***	Carl:

(2)

(c) Carl calls the number of counters in his bag ***c***.

Write **expressions using *c*** to show the number of counters in Bob's bag.

.....

(1)

(Total 4 marks)

6. Fill in the missing numbers using **only negative numbers**.

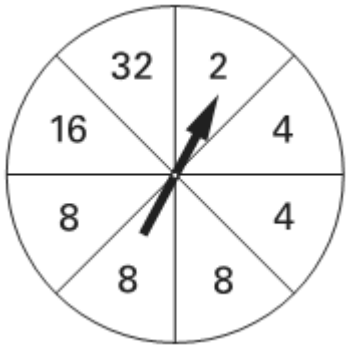
..... – ..... = 10

..... – ..... = – 10

(Total 2 marks)

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7. A spinner has **eight** equal sections.



(a) What is the probability of scoring **4** on the spinner?
Give your answer in the simplest form.

.....
(1)

(b) What is the probability of scoring an **odd** number on the spinner?

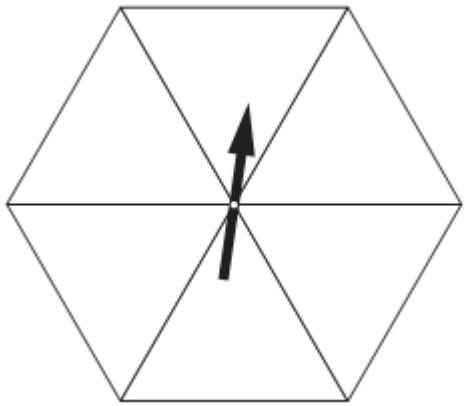
.....
(1)

A different spinner has **six** equal sections and six numbers.

On this spinner, the probability of scoring an **even** number is $\frac{2}{3}$.

The probability of scoring **4** is $\frac{1}{3}$.

(c) Write what numbers could be on this spinner.

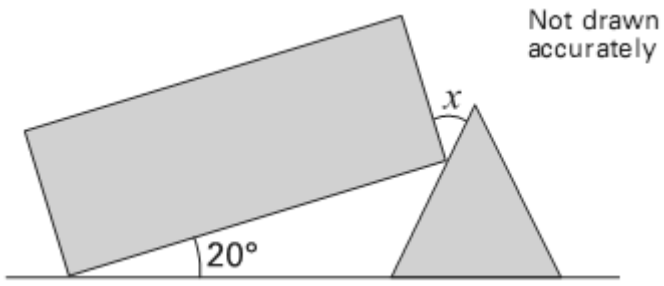


(2)

(Total 4 marks)

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8. The diagram shows a rectangle that just touches an equilateral triangle.

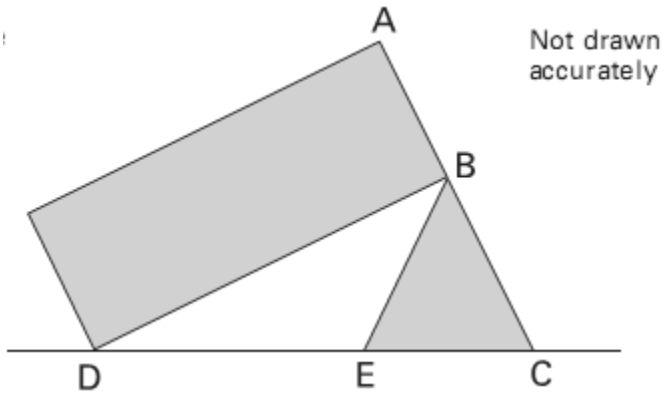


(a) Find the size of the angle marked *x*.
Show your working.

.....

(2)

Now the rectangle just touches the equilateral triangle so that ABC is a straight line.



(b) Show that triangle BDE is isosceles.

(2)

(Total 4 marks)

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9. Calculate

$\frac{1}{12}+\frac{1}{4}=$

.....
(1)

$\frac{2}{5}+\frac{3}{7}=$

.....
(1)

$\frac{1}{3}-\frac{2}{9}=$

.....
(1)

(Total 3 marks)

10. Paula played **four** games in a competition. In **three** games, Paula scored 8 points each time. In the **other** game she scored no points.

(a) What was Paula's mean score over the four games?

.....
(1)

Jessie only played **two** games. Her **mean** score was 3 points. Her **range** was 4 points.

(b) What points did Jessie score in her two games?

..... and .....
(1)

Ali played **three** games. His **mean** score was also 3 points. His **range** was also 4 points.

(c) What points might Ali have scored in his three games?
Show your working.

..... and ..... and .....
(2)

(Total 4 marks)

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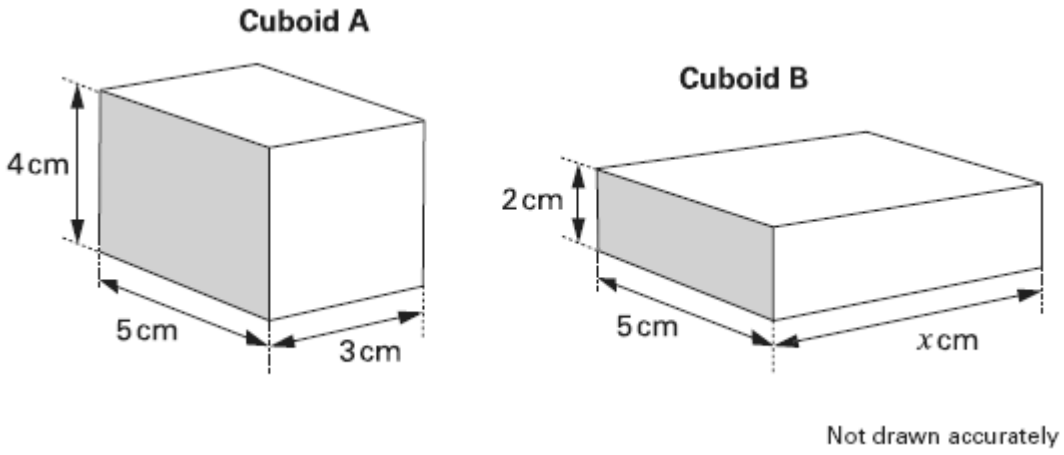
11. The radius of a circle is 10mm. Work out, using the value of $\pi = 3.14159$, the area of the circle to the nearest mm^2.

Show your working.

..... mm^2

(Total 2 marks)

12. The drawing shows 2 cuboids that have the same volume.



Not drawn accurately

Work out the value of the length marked *x*.

..... cm

(Total 3 marks)

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13. Work out the number of boys and girls in each class below.

(a) In class 8A, there are 21 pupils.

There are **twice as many** boys as girls.

Number of boys	Number of girls

(1)

(b) In class 8B, there are 22 pupils.

There are **two more** boys than girls.

Number of boys	Number of girls

(1)

(c) In class 8C, there are 12 boys.

The **ratio** of boys to girls is 2 : 1

Number of boys	Number of girls

(1)

(Total 3 marks)

14. I think of a number.
I **multiply** this number by 4, then **subtract** 32
The result is **twice** the number that I was thinking of.

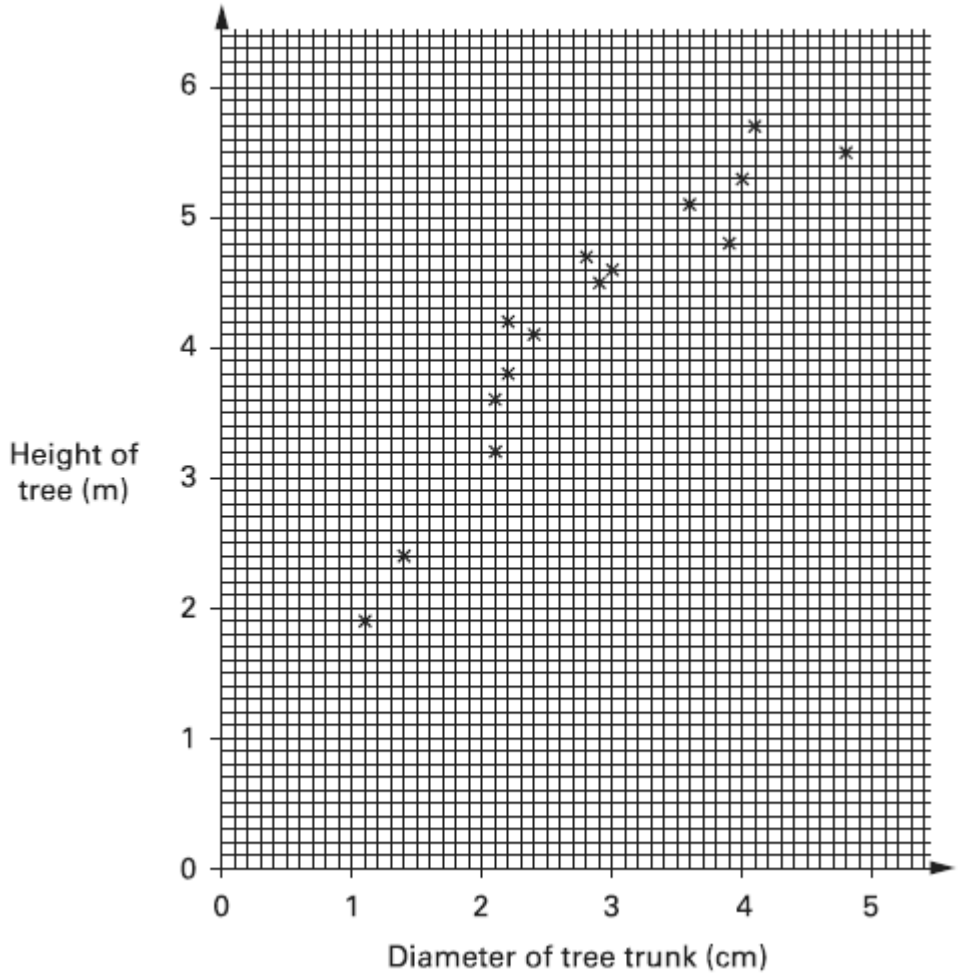
What is the number I was thinking of?

.....

(Total 2 marks)

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15. The scatter graph shows information about trees called poplars.



(a) What does the scatter graph show about the relationship between the diameter of the tree trunk and the height of the tree?

……

……

……

……

(1)

(b) The height of a different tree is 2m. The diameter of its trunk is 5cm.
Use the graph to explain why this tree is not likely to be a poplar.

……

……

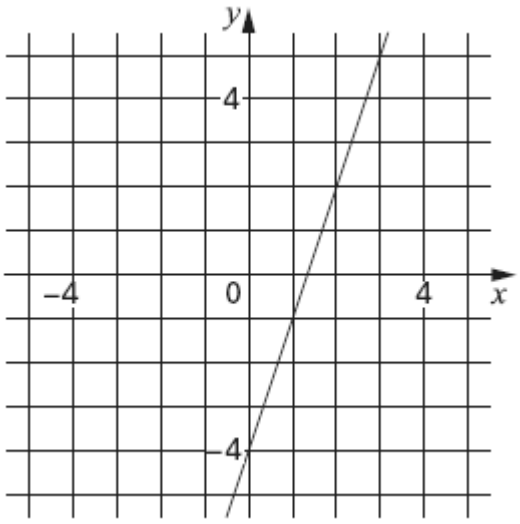
……

(1)

(Total 2 marks)

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16. The graph shows the straight line with equation $y = 3x - 4$



(a) A point on the line $y = 3x - 4$ has an ***x*-coordinate** of 11.
What is the *y*-coordinate of this point?

.....
(1)

(b) A point on the line $y = 3x - 4$ has an ***y*-coordinate** of 11.
What is the *x*-coordinate of this point?

.....
(1)

(c) Is the point (–10, 34) on the line $y = 3x - 4$?

☐ Yes ☐ No

Show how you know.

(1)

(Total 3 marks)

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17. A spinner has the numbers 1 to 5 on it.

The probability of spinning a number 1 is 0.07

The probability of spinning a number 2 is 0.6

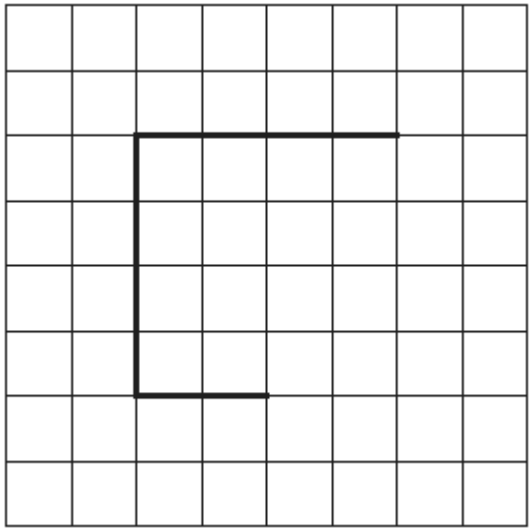
The probability of spinning a number 3 is the same as the probability of spinning a number 4 or 5.

Calculate the probability of spinning a number 4.

.....

(Total 2 marks)

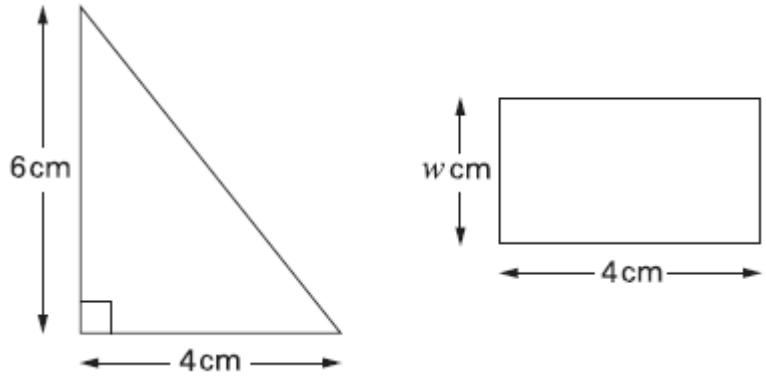
18. Here are three lines on a centimetre square grid.
Draw two more lines on the grid to make a pentagon that has an area of 14cm^2.



(Total 1 mark)

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19. The area of the triangle is twice the area of the rectangle.



Work out the value of w

..... cm

(Total 3 marks)

20. Doctors sometimes use this formula to calculate how much medicine to give a child.

$$c = \frac{ay}{12 + y}$$

c is the correct amount for a child, in ml
a is the amount for an adult, in ml
y is the age of the child, in years

(a) A child who is 8 years old needs some medicine. The amount for an adult is 10ml. Use the formula to work out the correct amount for this child.

..... ml
(2)

(b) Another child needs some medicine. The amount for an adult is 10ml. The correct amount for this child is 2ml. How old is this child?

..... years
(2)

(Total 4 marks)

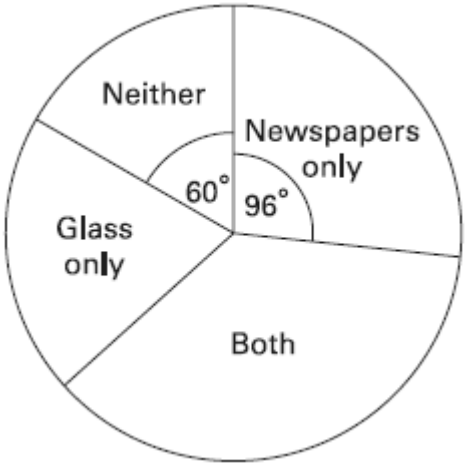
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21. Convert 1230000000 millimetres into kilometres.

…… km

(Total 1 mark)

22. In her survey Sue asked people whether they recycled newspapers and glass.
The pie chart shows the results.



20 people answered '**Neither**'.

How many answered '**Newspapers only**'?

Show your working.

…… people

(Total 2 marks)

END OF SECTION A

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SECTION B

Answer ALL FOUR questions.

Write your answers in the spaces provided.

1. A very simple robot can be programmed to carry out basic drawing tasks. The robot responds to two instructions only - FORWARD(*x*) and TURN(*x*).

- FORWARD(*x*) – robot moves x meters forward drawing a straight line *x* meters long.
- TURN(*x*) – robot turns through x degrees in anticlockwise direction (facing different direction, not drawing)

Write down the set of instructions needed for the robot to draw:

(a) a **square** with a side length of 5m.

……

……

……

……

(2)

(b) an **equilateral** triangle with a side length of 2m.

……

……

……

……

(3)

(Total 5 marks)

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2. Two speedboats, A and B, are leaving a harbour at exactly the same time. Boat A is moving on a bearing of 015° with a speed of 90 km/h and boat B on a bearing of 105° with a speed of 120 km/h. Find the distance, in kilometres, between the boats 6 minutes after they left the harbour.

…… km

(Total 5 marks)

3. There are 53 students accommodated in 21 rooms of a youth hostel. Each room has either 2 or 3 beds. Assuming that each student sleeps in one bed only and that every bed is used, find out how many rooms with 2 beds and how many rooms with 3 beds are there.

(Hint: let x represent the number of rooms with 2 beds and let y represent the number of rooms with 3 beds)

…… 2 beds

…… 3 beds

(Total 5 marks)

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4. The following sequence of numbers

16, 8, 12, 10, 11, 10.5, …

has the first two terms equal to 16 and 8 and any other term is the mean of the previous two terms.

(a) A sequence, following the same rule, starts with numbers $u_1 = -8$ and $u_2 = -12$.
Work out u_3 and u_4 (the third and the fourth term).

u_3 = ...

u_4 = ...

(2)

(b) Another sequence, following the same rule, has $u_3 = 6n$ and $u_4 = 5n$.
Work out the first two terms of this sequence giving the answer in terms of n.

u_1 = ...

u_2 = ...

(3)

(Total 5 marks)

END OF SECTION B

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