MERCHANT TAYLORS'
School

Entrance Examination
January 2021

MATHEMATICS

1 HOUR

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1. The distance around the centre of the Earth was once calculated as 40,075,406 metres.

(i) Write this number in words.

Answer: ………………………………………………………………………………………

……………………………………………………………………………………… *(1 mark)*

(ii) Round this number to the nearest thousand metres.

Answer: ……………………………… *(1 mark)*

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2. (i) Find 15% of 156.

Answer: ……………………… *(1 mark)*

(ii) Find 2% of 156.

Answer: ……………………… *(1 mark)*

(iii) Find 17% of 156.

Answer: ……………………… *(1 mark)*

(iv) Round 15.56 to 1 decimal place.

Answer: ……………………… *(1 mark)*

TURN OVER!

3. The diagram shows two triangles, **A** and **B**.
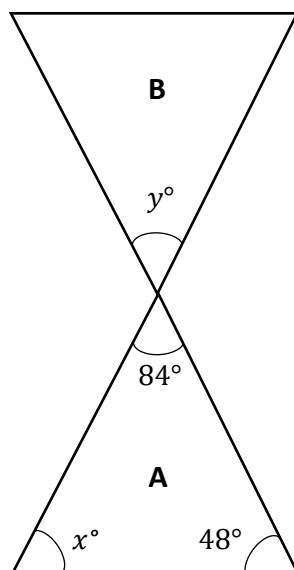
(i) Calculate the value of x.

Answer: ……………………° (2 marks)

(ii) What is the name given to the type of triangle that **A** is?

Answer: ……………………… (1 mark)

(iii) Write down the value of y.

Answer: ……………………° (1 mark)

(iv) Give a reason to justify your answer to part (iii).

Answer: ………………………………………………………………………… (1 mark)

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4. Below is a train timetable showing arrival and departure times.

	Train A		Train B		Train C	
	Arrival	Departure	Arrival	Departure	Arrival	Departure
Perch Street	09:20	09:25	11:35	11:40	13:45	13:50
Carp Close	09:30	09:35	11:45	11:50	13:55	14:00
Pike Avenue	09:40	09:45	11:55	12:00	-	-
Bream Station	09:55	10:00	12:10	12:15	-	-
Roach Town	10:05	10:10	12:20	12:25	14:15	14:20
Tenchville	10:15	10:20	12:30	12:35	14:25	14:30

(i) What time does the 09:45 (train A) from Pike Avenue arrive at Roach Town?

Answer: ……………………… (1 mark)

(ii) How long does it take the 14:00 from Carp Close to get to Roach Town?

Answer: ……………………… (1 mark)

(iii) Which train is quickest going from Perch Street to Tenchville?

Answer: Train ……………………… (1 mark)

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5. Put the following lengths in order of size, starting with the **shortest:**

$6.24\ m$ $0.624\ km$ $62400\ mm$ $62.4\ cm$

Answer: ……………………………………………………………………………… (2 marks)

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TURN OVER!

6. The chart below shows the number of goals scored by a football team in each game over a season:

Goals scored by the football team during the season

Number of goals scored
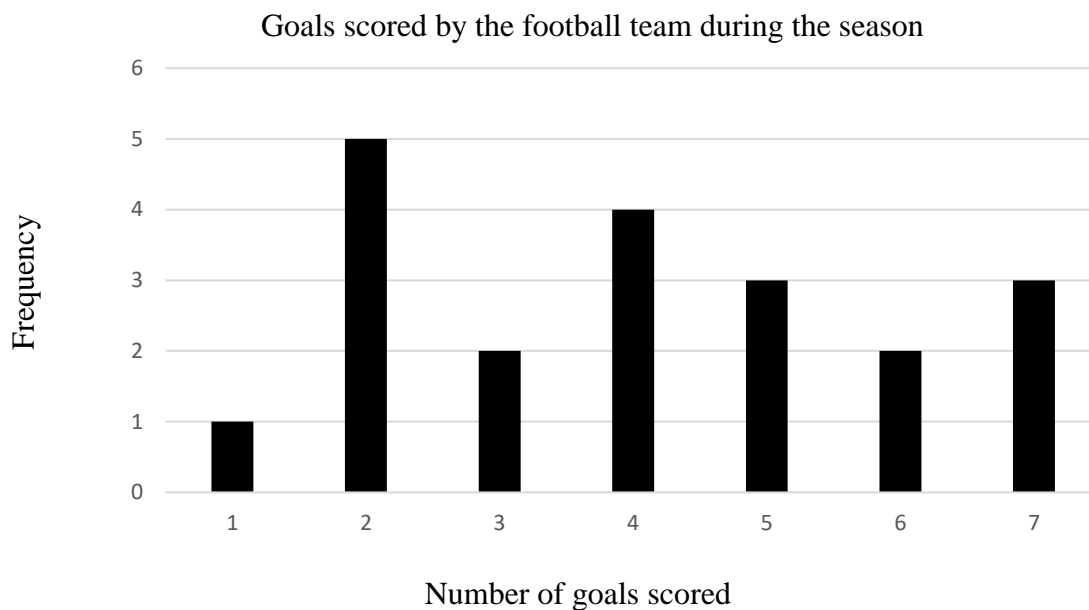
(i)   In how many games were two goals scored?

Answer: ……………………… (1 mark)

(ii)   In how many games were three or more goals scored?

Answer: ……………………… (1 mark)

(iii)   How many games were played altogether?

Answer: ……………………… (1 mark)

(iv)   What was the most frequent number of goals scored in a game?

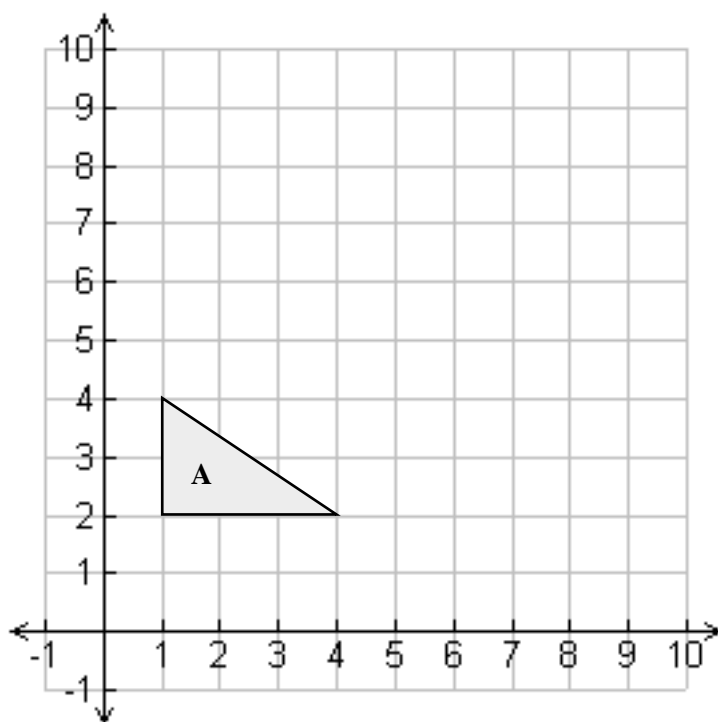*Answer: ……………………… (1 mark)*

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7. (i) Write 45p as a fraction of £2 in its simplest form.

Answer: ……………………… (1 mark)

(ii) Calculate 4023 ÷ 23, giving your final answer as a **mixed number**.

Answer: ……………………… (2 marks)

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8. Translate shape **A** 3 squares to the right and 1 square up.

(1 mark)

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TURN OVER!

9. (i) List all the factors of 36.

Answer: ………………………………………………………………………… *(2 marks)*

(ii) List the first 4 multiples of 12.

Answer: ……………, ……………, ……………, …………… *(1 mark)*

(iii) Calculate the Highest Common Factor of 12 and 36.

Answer: …………………… *(2 marks)*

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10. Some friends measured the distances between each other's houses, by taking the most direct route they could walk in kilometres. They made the table below:

		George	Dylan
			2.1
		George	2.1
	Arun	4.8	4.3
Harry	3.6	4.2	3.8

(i)   How far does Dylan live from Arun?

Answer: …………………….. km (1 mark)

(ii)   George decided he would walk to a different friend's house and back to his house each day, over three days. How many kilometres did he walk in total?

Answer: …………………….. km (2 marks)

(iii)   What is the mean distance from Dylan's house to his friends' houses?

Answer: …………………….. km (2 marks)

11. A shape is formed by attaching an equilateral triangle to all four sides of a square, as shown in the diagram.
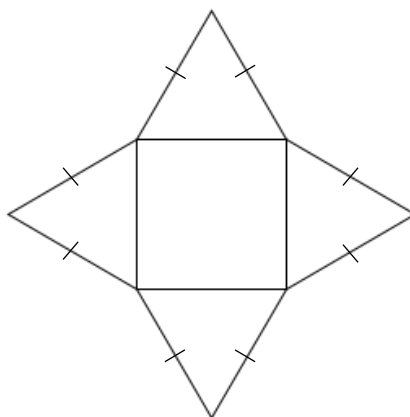
Given that the perimeter of the shape is 88 cm, find the area of the square.
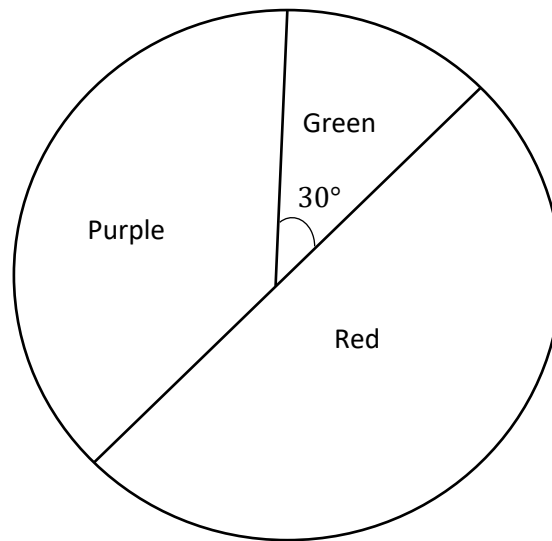
Answer: ……………………… cm^2 (3 marks)

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12. (i) On a map, 1 cm represents 50,000 cm in real life. What real life distance is represented by 6 cm on the map? Give your answer in kilometres.

Answer: ……………………… km (2 marks)

(ii) Convert 585 minutes into hours. Give your answer as a **mixed number**.

Answer: ……………………… hours (2 marks)

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13. A class of 36 pupils were asked to pick their favourite colour from green, purple or red.

(i) How many pupils chose green?

Answer: ……………………… (1 mark)

(ii) What is the probability that a pupil chosen at random chose purple or green?

Answer: ……………………… (1 mark)

(iii) What is the probability that a pupil chosen at random chose red or green?

Answer: ……………………… (1 mark)

(iv) The whole year group were asked the same question. The pie chart looked exactly the same. If 30 pupils chose purple how many pupils are in the year group?

Answer: ……………………… (2 marks)

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9 ***TURN OVER!***

14. A sequence starts with the number -3 and increases by 6 each time.
Write down the first number in the sequence which is:

(i) A prime number

Answer: ……………………… (1 mark)

(ii) A square number

Answer: ……………………… (1 mark)

(iii) A cube number

Answer: ……………………… (1 mark)

(iv) A triangular number

Answer: ……………………… (1 mark)

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15. (i) Kunal has two £20 notes. Kunal buys 6 tickets to the latest hit show, "The Mathemagicians", which cost £4.50 each. He sells five of the tickets for £6.20 each and keeps one for himself. How much money does Kunal have now?

Answer: £ ……………………… (2 marks)

(ii) Harvir is one of seven children who were all born 2 years apart. The youngest is Nilen who is only seven years old while Harvir is the oldest. What is Harvir's age?

Answer: ……………………… (2 marks)

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16. The formula below is used to calculate the cost of a monthly electricity bill:

$$Cost = 22 \; pence \; per \; day + 16 \; pence \; per \; kWh \; used$$

(i) If 100 kWh were used in the 30 days of November, calculate the cost that month. Give your answer in pounds and pence.

Answer: £ ……………………… (2 marks)

(ii) The bill for January was £10.02. Calculate the number of kWh used that month.

Answer: ………………………kWh (2 marks)

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17. In a kettle there are $1\frac{4}{7}$ litres of water. A cup holds $\frac{2}{7}$ of a litre of water.

(i) How many full cups of water can be filled from the kettle?

Answer: ……………………… (2 marks)

(ii) The remaining water is poured into a cup. What percentage of this cup is filled with water?

Answer: ……………………… (1 mark)

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TURN OVER!

18. Ash has three times as many "Pokemon" cards as Ben has. Catherine has five more cards than Ben. If Catherine has 54 "Pokemon" cards, how many does Ash have?

Answer: ……………………… (2 marks)

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19. Two numbers multiply together to make -24. They add together to make 10. What are the two numbers?

Answer: ……………………… and ……………………… (2 marks)

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20. (i) My recipe for Chocolate Fridge Cake consists of 40 *g* of chocolate and 100 *g* of biscuits. If I only have 75 *g* of biscuits then how much melted chocolate will I have to use?

Answer: ……………………… g (2 marks)

(ii) I divided some money between Alex, Ben and Charlie. Charlie was given twice as much as Ben. Alex was given 4 times as much as Ben. If Charlie was given £80, what was the total amount I started with?

Answer: £ ……………………… (2 marks)

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21. A sequence goes up by the same amount each time.
If the third term of the sequence is 17 and the seventh term of the sequence is 45,

(i) Find the first term of the sequence.

Answer: ……………………… (2 marks)
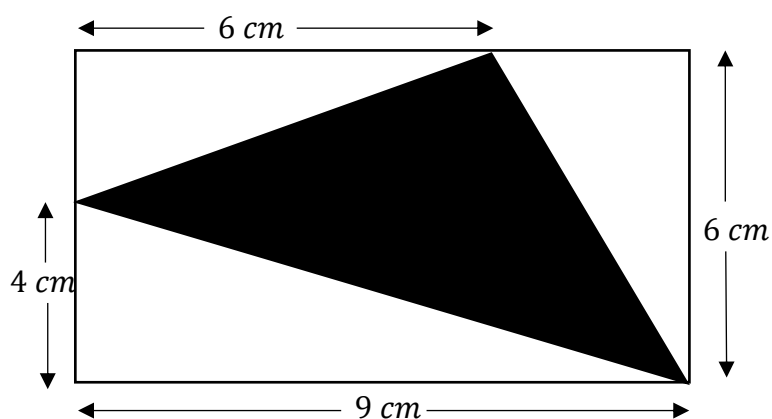
(ii) Write, in words, the term-to-term rule for the sequence.

Answer: ……………………………………………………………………………… (1 mark)

(iii) Find the 57th term of the sequence.

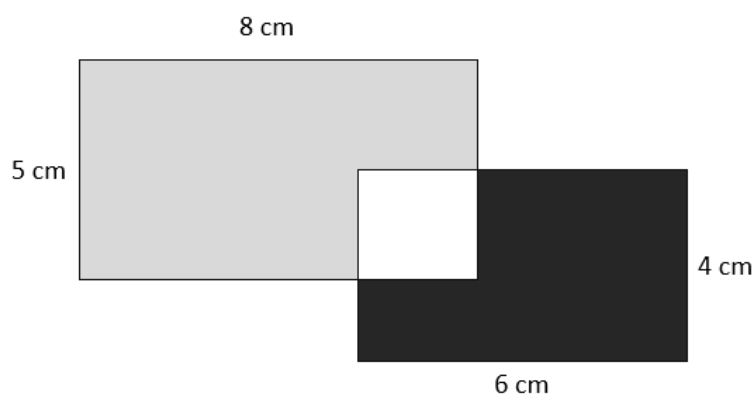*Answer: ……………………… (2 marks)*

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TURN OVER!

22. (i) Calculate the area of the shaded triangle.

Answer: ……………………… cm² (3 marks)

(ii) Two rectangles with dimensions 8 *cm* by 5 *cm* and 6 *cm* by 4 *cm* overlap to form a grey, a white and a black region, as shown in the diagram.

Given that the area of the grey region is 36 *cm²*, find the area of the black region.

Answer: ……………………… cm² (3 marks)

23. Fatouma was asked how old she was. In reply she said,

"In two years' time I will be twice as old as I was five years ago."

How old is Fatouma?

Answer: …………………… (2 marks)

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24. Julian has thirty coins consisting of 20p and 5p coins. In total they add to £4.20.

How many of each coin does he have?

Answer: …………………….20p coins and ……………………. 5p coins (3 marks)

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25. The sum of the numerator and denominator of a fraction is 12. If the denominator is increased by 3, the fraction becomes $\frac{1}{2}$. Find the original fraction.

Answer: …………………… (3 marks)

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26. A team of 5 students represent England in a junior international chess competition.
One student decides to take their ages and calculate three different averages.
The mode of the team was 7, the mean age was 9 and the median age was 8.
Given also that the range of their ages is 6, how old was the second oldest member?

Answer: …………………… (2 marks)

27. How many seconds are there in $\frac{1}{6}$ of $\frac{1}{8}$ of $\frac{1}{10}$ of a day?

Answer: ………………………. (4 marks)

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TURN OVER!

28. ℘ is a new mathematical rule that works like this:

To work out $x \wp y$ you add 3 to x and then divide by y.

For example:

$$9 \wp 4 = ?$$

$$9 + 3 = 12, \text{ then } 12 \div 4 = 3$$

$$\text{So } 9 \wp 4 = 3.$$

(i)   Work out $12 \wp 3$

Answer: ……………………… (1 mark)

(ii)   Work out $3 \wp 5$

Answer: ……………………… (1 mark)

(iii)   If $27 \wp x = 10$, what number does x stand for?

Answer: ……………………… (2 marks)

(iv)   If $z \wp z = 5$, what number does z stand for?

Answer: ……………………… (2 marks)

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END OF EXAMINATION

NOW CHECK YOUR WORKING