Name……..

School……

MERCHANT TAYLORS' SCHOOL

13+ ENTRANCE EXAMINATIONS

MATHEMATICS
SPECIMEN PAPER

Time Allowed: One Hour

Instructions
All the questions should be attempted.
Write all your answers on the question paper.
A row of dots……indicates a space for you to fill in.
Electronic calculators may be used in any question

Advice
Failure to show necessary working may result in loss of marks.
The figures in brackets [ ] give the number of marks available for each question.
Total marks: 100

1. Use your calculator to work out the following calculation. Write down all the digits of the answer.

$$\frac{3(77.07 - \sqrt[3]{85})}{(6.2 - 1.789)^3 + 8}$$

Answer: …… [1 mark]

(ii) Round your answer from part (i) to 3 decimal places.

Answer: …… [1 mark]

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2. Alice has been asked to complete some multiplication questions. The first question is 342×51.

(i) Calculate 342×51. **Show all your working.**

Answer: …… [3 marks]

(ii) Alice claims that even if you multiply lots of prime numbers together, you can never get an even number. Explain why Alice is wrong.

Answer:

……

……

……

……

……

[1 mark]

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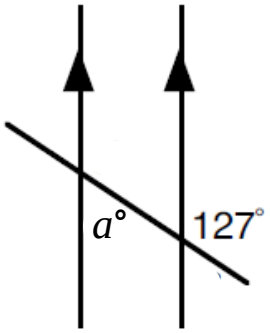
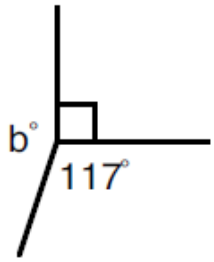
3. Calculate the unknown angle in each of the diagrams below:

(i)



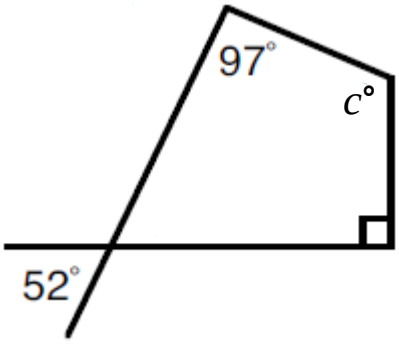
Answer: a =……° [1 mark]

(ii)



Answer: b =……° [1 mark]

(iii)



Answer: c =……° [2 marks]

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4. In a recipe for biscuits, the ratio of sugar to flour to butter is given as $3 : 6 : 4$.

Jamie is cooking for his brother's birthday and 40 people are coming. Each person will eat 4 biscuits on average. One biscuit uses 0.013kg of ingredients before cooking. How much of each ingredient does he require in grams?

Answer: sugar =……g, flour = ……g, butter =……g [3 marks]

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5. Find the values of the following expressions, where $a = 2,\ b = -5,\ c = 0.5,\ d = -20$.

(i) abc

Answer: …… [1 mark]

(ii) $2d + 10c$

Answer: …… [1 mark]

(iii) $b^2 - d$

Answer: …… [2 marks]

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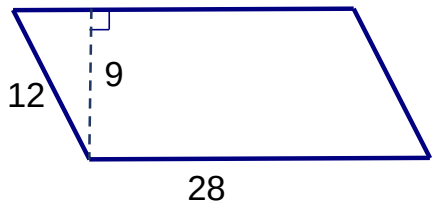
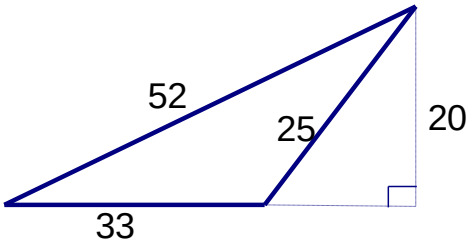
6. Find the areas of each of the following shapes, where all measurements are in cm. Give your answers to the nearest whole number, where necessary.
The diagrams are not accurately drawn.

(i) Parallelogram:



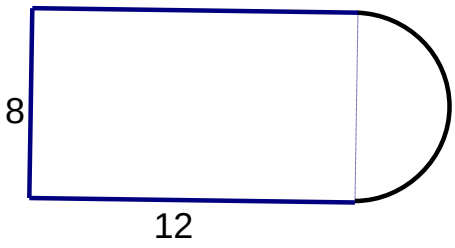
Answer: ……cm² [2 marks]

(ii) Triangle:



Answer: ……cm² [2 marks]

(iii) Rectangle with semicircle:



Answer: ……cm² [3 marks]

7. Sachin keeps a record of the wickets taken during each match over the last year for his school team. The following frequency table shows these results:

Number of Wickets	Frequency
0	4
1	8
2	7
3	6
4	4
5	5
6	2
7	2

(i) Find the mean number of wickets taken per match, give your answer to 3s.f.

Answer: ……wickets [3 marks]

(ii) The modal number of wickets taken per match.

Answer: ……wickets [1 mark]

(iii) The median number of wickets taken per match.

Answer: ……wickets [1 mark]

(iv) Sachin plays one more match and takes 8 wickets.
Explain clearly whether this would increase or decrease the old mean.

Answer: ……
……
……
……

[1 mark]

8. (i) Find 52% of $4.

Answer: $…… [2 marks]

(ii) House prices fell by 2% in London over December. If a house was being sold for £685,000 at the start of the month, how much would it be sold for at the end of the month?

Answer: £…… [2 marks]

(iii) At the start of the year a summer holiday to Spain cost £650. It increased by 11% in March and by a further 8% in May. Calculate the final cost of the holiday after the two increases. Give your answer to the nearest £.

Answer: £…… [3 marks]

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9. Fill in the missing two numbers in the following sequences:

(i) 35 , 22 , 9 , ……. , −17 , …….

(ii) ……. , 2.5 , 1.25 , 0.625 , …….

[2 marks]

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10. A six-sided dice, numbered 1 to 6, is rolled once. The table shows the probability of each number showing:

Number	1	2	3	4	5	6
Probability	0.35	0.2		0.1	0.1	0.1

(i) What is the probability of dice landing on the number 3?

Answer: …… [1 mark]

(ii) The dice is rolled 220 times. How many times would you expect the dice to land on the number 1?

Answer: …… [2 marks]

(iii) Is this dice fair? Give a reason for your answer.

Answer: ……

Reason: ……

……

……

……

[1 mark]

11. (a) Show that

$$3\frac{5}{7} \div 2\frac{1}{3} = 1\frac{29}{49}$$

Clearly show your full method.

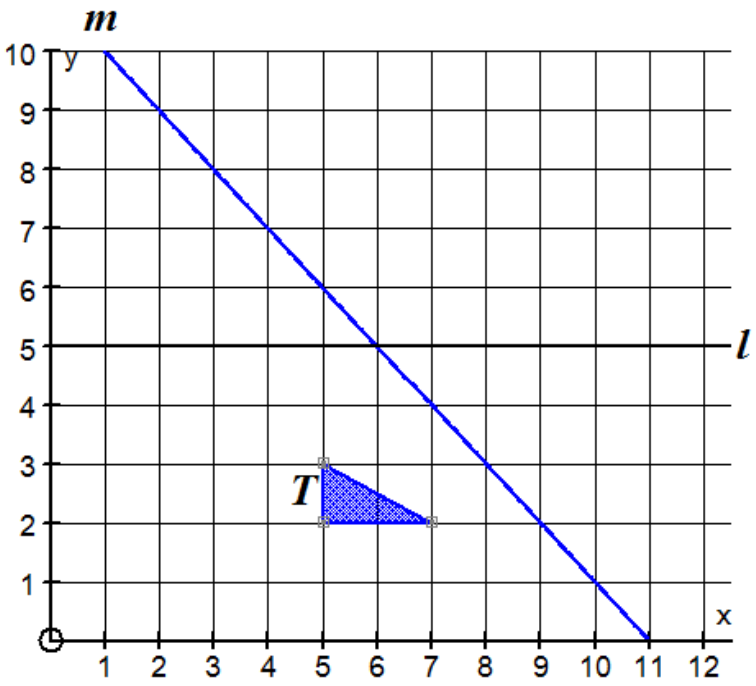
[3 marks]

(b) Starting with the smallest, list these numbers in ascending order. **You must clearly show your full method (just writing the answer will gain no marks).**

$$3.24 \quad 3\frac{1}{4} \quad 3\frac{7}{25} \quad 327\% \quad 3.27\% \quad 3\frac{11}{50}$$

Answer: …… *[3 marks]*

12.



(a) On the diagram above:

(i) draw in the triangle *B*, which is the image of *T* under an enlargement, centre (7, 0) and scale factor 3. *[2 marks]*

(ii) draw in the triangle *C*, which is the image of *T* under a reflection in the horizontal line *l*. *[2 marks]*

(iii) draw in the triangle *D*, which is the image of *T* under a reflection in the diagonal line *m*. *[2 marks]*

(b) Describe fully the single transformation which maps triangle *C* to triangle *D*.

Answer: ……

……

[2 marks]

13. Insert brackets **where necessary** to make these calculations correct. You may not need to add brackets at all.

(i) $5 - 4 \times 3 + 2 = 5$

[1 mark]

(ii) $27 \div 2 + 1 - 1 = 8$

[1 mark]

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14. Factorise fully:

(i) $45 - 9x$

Answer: …… [1 mark]

(ii) $2x^2 + 12x$

Answer: …… [2 marks]

(iii) $3pq^4 - 12q^2p^6$

Answer: …… [2 marks]

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15. A sequence begins $3, -2, -7, -12, \ldots, \ldots$

(i) Write down the next two terms in the sequence.

Answer: …… and …… [2 marks]

(ii) Find the n^{th} term of the sequence.

Answer: …… [2 marks]

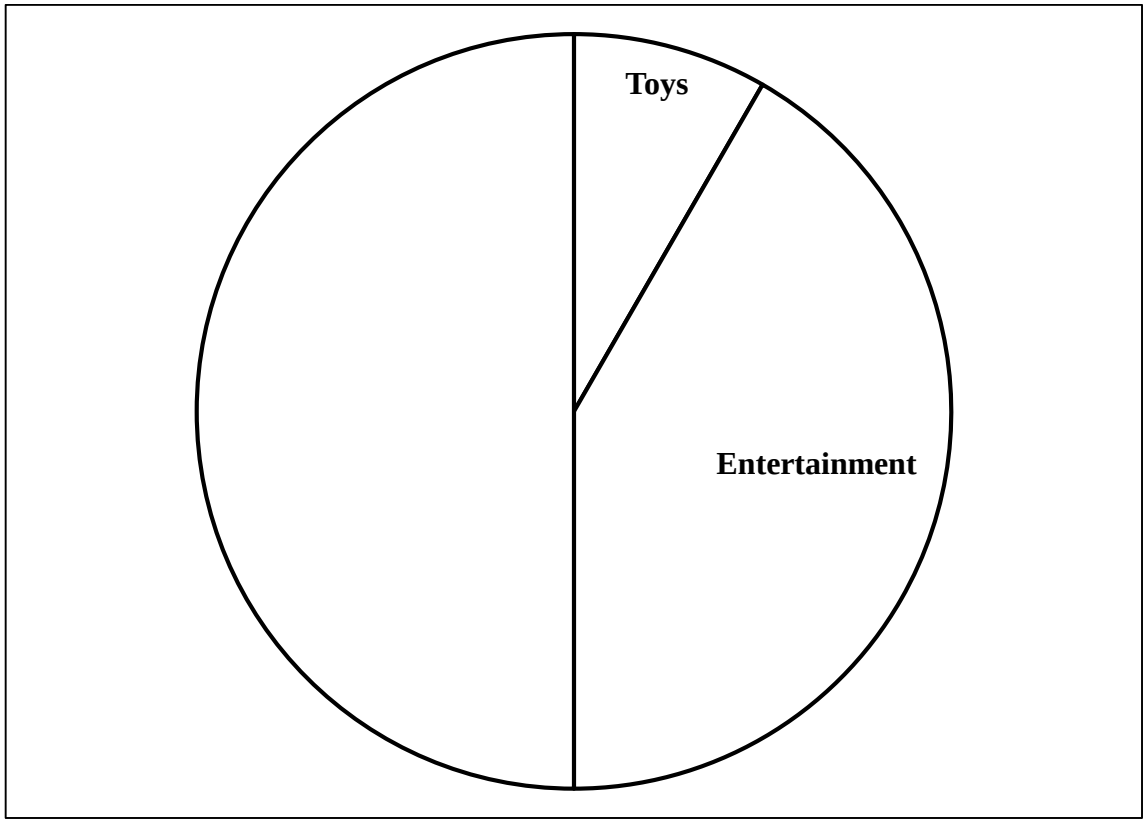
(iii) Find the 300^{th} term. **Clearly show your method.**

Answer: …… [2 marks]

(iv) Which term is equal to -127? **Clearly show your method.**

Answer: …… [2 marks]

16. Aaron receives £600 of pocket money a year which he spends on toys, entertainment, presents and sweets. Aaron also puts some money into savings.
The incomplete pie chart shows the amount Aaron spent on some of the items over the year:



(i) How much did Aaron spend on entertainment?

Answer: £…… [2 marks]

(ii) Aaron spent £100 on sweets and £120 on presents. Represent this information clearly on the pie chart.

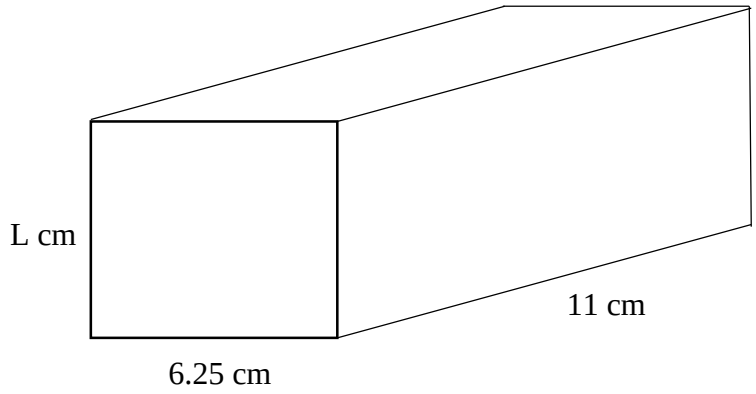
[2 marks]

(iii) How much money did Aaron save during the year?

Answer: £…… [2 marks]

17. Below is a picture of a gold bar which was presented to the first state of the Commonwealth. It is said that the gold bar has special properties of peace and prosperity to help the commonwealth grow and thrive. The gold bar has a mass of 99 grams and has a density of $0.3 g/cm^3$.

Diagram is not accurately drawn



$$Density = \frac{Mass}{Volume}$$

(i) Using the formula given above, calculate the volume of the gold bar.

Answer: ……cm^3 [2 marks]

(ii) Hence find the missing length, L, in centimetres.

Answer: ……cm [3 marks]

18. Points *A, B, C* lie on level ground.
As is shown in the diagram $\angle ABC = 72°$ and $\angle CAB = 20°$.

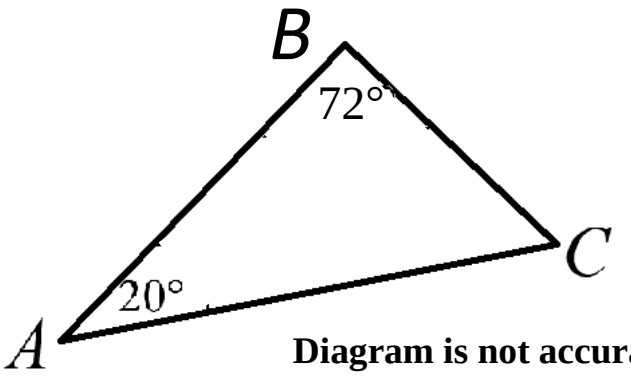


Diagram is not accurately drawn

Given also that the bearing of *B* from *A* is 051°, calculate the following bearings:

(i) *C* from *A.*

Answer: ……° [1 mark]

(ii) *C* from *B.*

Answer: ……° [2 marks]

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19. Express 336 as the product of its prime factors in the form $2^a \times 3^b \times 7$ where a and b are positive integers. **Clearly show your method for obtaining these values.**

Answer: a =…… and b =…… [2 marks]

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20. Solve the following equations **(clearly showing your method)**:

(i) $2x - 1 = -13$

Answer: $x =$ …… *[1 mark]*

(ii) $11 - 2x = -2$

Answer: $x =$ …… *[2 marks]*

(iii) $\frac{3}{5}(15x + 1) = 10$

Answer: $x =$ …… *[3 marks]*

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21. A sports complex wants to build a new swimming pool. It is in the shape of a circle and is 2 m deep. If the pool has a diameter of 6 m how many litres of water are required to fill it? You may use the fact that $1m^3 = 1000$ litres. Give your answer to 3 significant figures.

Answer: ……*litres [3 marks]*

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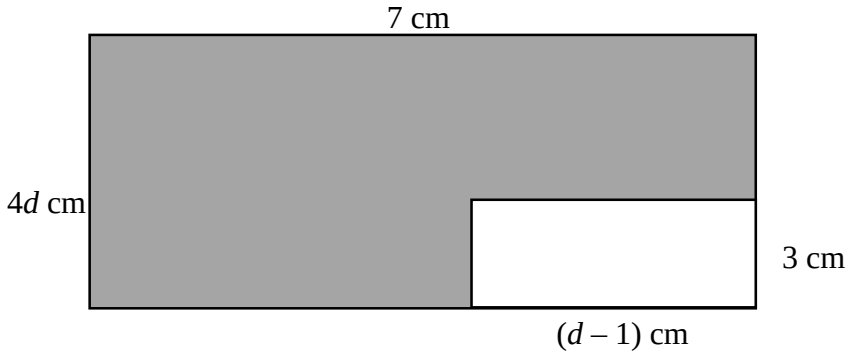
22. The area of the shaded part of the shape is $53cm^2$, find the value of d.

Diagram is not accurately drawn



Explain your method clearly.

Answer: d =……cm [3 marks]

END OF EXAMINATION

NOW CHECK YOUR WORKING