DULWICH COLLEGE
FOUNDED 1619

Year 9 Entrance and Scholarship Examination Mathematics

Specimen Paper B

TIME allowed for this paper: 90 minutes

Instructions

- Use a calculator where appropriate.
- Answer all the questions.
- Show all your working.
- Marks for questions are shown in square brackets [ ].
- There are 125 marks in total
- You must not write in the squares at the bottom right of each page

1. Use your calculator to work out the value of:

$$\sqrt{\frac{3+\sqrt{2}}{4}}$$

(a) Write down all of the digits shown on your calculator:

Answer: _____ [1]

(b) Write your answer to (a) rounded to 1 decimal place:

Answer: _____ [1]

(c) Write your answer to (a) rounded to 4 significant figures:

Answer: _____ [1]

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2. (a) 140 students sat a Mathematics examination. 7 forgot their calculators. Calculate the percentage of students who forgot their calculators.

Answer: _____ % [2]

(b) A teacher has purchased some calculators from a shop for £12 each and decides to sell these calculators to those forgetful students. For each calculator sold the teacher decides to make a 25% profit. Calculate how much each student pays for a calculator.

Answer: £ _____ [2]

(c) In fact, one fifth of the students failed to turn up to the examination. Calculate how many should have turned up in total given that 140 sat the examination.

Answer: _____ [2]

Page total:

3. Simplify the following:

(a) $3ab - 4a + 6b - ab - 3a - 10b$

Answer: _____ [2]

(b) $4(3x - 2)$

Answer: _____ [2]

(c) $3 - (4x - 2) - 6x$

Answer: _____ [2]

(d) $(x - 2)(x + 7)$

Answer: _____ [3]

(e) $\dfrac{56ab^3}{8a^3b^2}$

Answer: _____ [2]

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4. The diagram below shows two parallel lines and a triangle with two equal sides as indicated. Calculate the values of x and y.

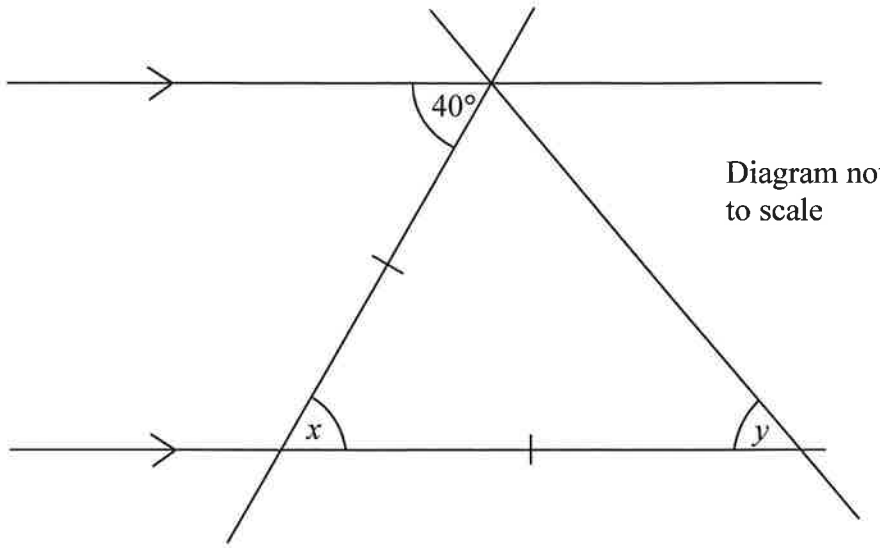

Diagram not drawn to scale

Answer: $x =$ _____ $y =$ _____ [3]

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5. The current world record for the men's 100 metre sprint is 9.58 seconds.

Writing your answers to 3 significant figures, calculate the average speed of the world record holder in:

(a) metres per second,

Answer: _____ m/s [2]

(b) kilometres per hour,

Answer: _____ km/h [3]

(c) miles per hour (note that one kilometre is roughly 0.621 miles).

Answer: _____ miles/h [2]

Page total:

6. (a) State the largest number less than 25 which is:

(i) a prime number,

Answer: _____ [1]

(ii) a square number,

Answer: _____ [1]

(iii) a triangular number.

Answer: _____ [1]

(b) For the sequence of numbers:

3, 7, 11, 15, ...

calculate:

(i) the 6^{th} term in the sequence,

Answer: _____ [1]

(ii) the n^{th} term in the sequence,

Answer: _____ [2]

(iii) the term of the sequence which has a value of 3999.

Answer: _____ [2]

Page total:

7.

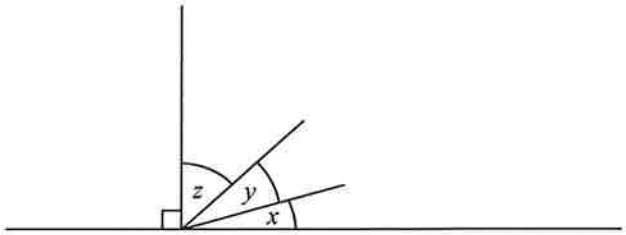


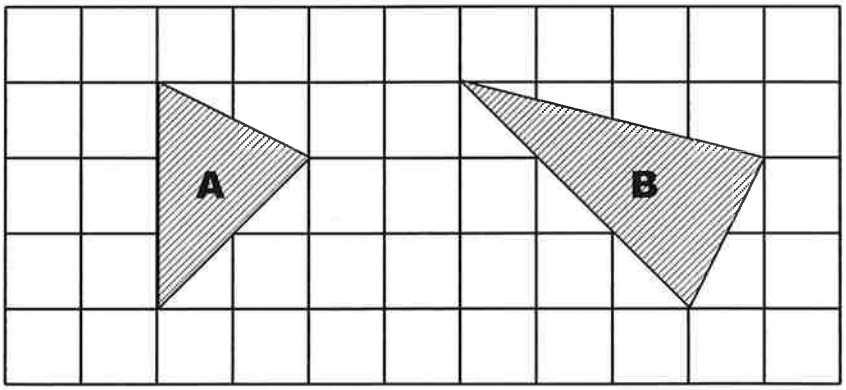
Diagram not drawn to scale

In the diagram shown above you are told that the angle marked y is twice as big as the angle marked x and the angle marked z is three times as big as that marked x.

Calculate the size of the angles marked x, y and z.

Answer: $x =$ _____, $y =$ _____, $z =$ _____ [4]

8.



Given that the above grid is made of squares with sides of 1 cm, calculate the area of:

(a) triangle A,

Answer: _____ cm^2 [2]

(b) triangle B.

Answer: _____ cm^2 [2]

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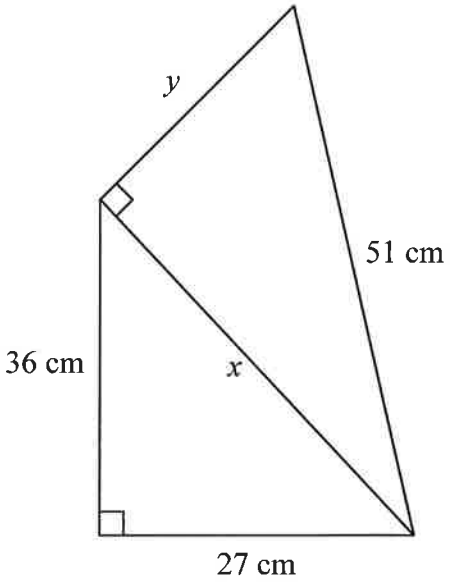
9. The diagram below shows two right angled triangles. Calculate x and y.



Answer: $x =$ _____ cm, $y =$ _____ cm [4]

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10. 2, 2, 2, 3, 4, 5

For the data above calculate:

(a) the median,

Answer: _____ [1]

(b) the mean.

Answer: _____ [2]

Two more values, x and y, are added to the data list. The range of the new data list is 6 and its new mean is 3.75.

(c) Calculate the values of x and y.

$x =$ _____, $y =$ _____ [3]

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11. (a) Complete the tables of values for the following straight lines:

(i) $y = 2x - 2$

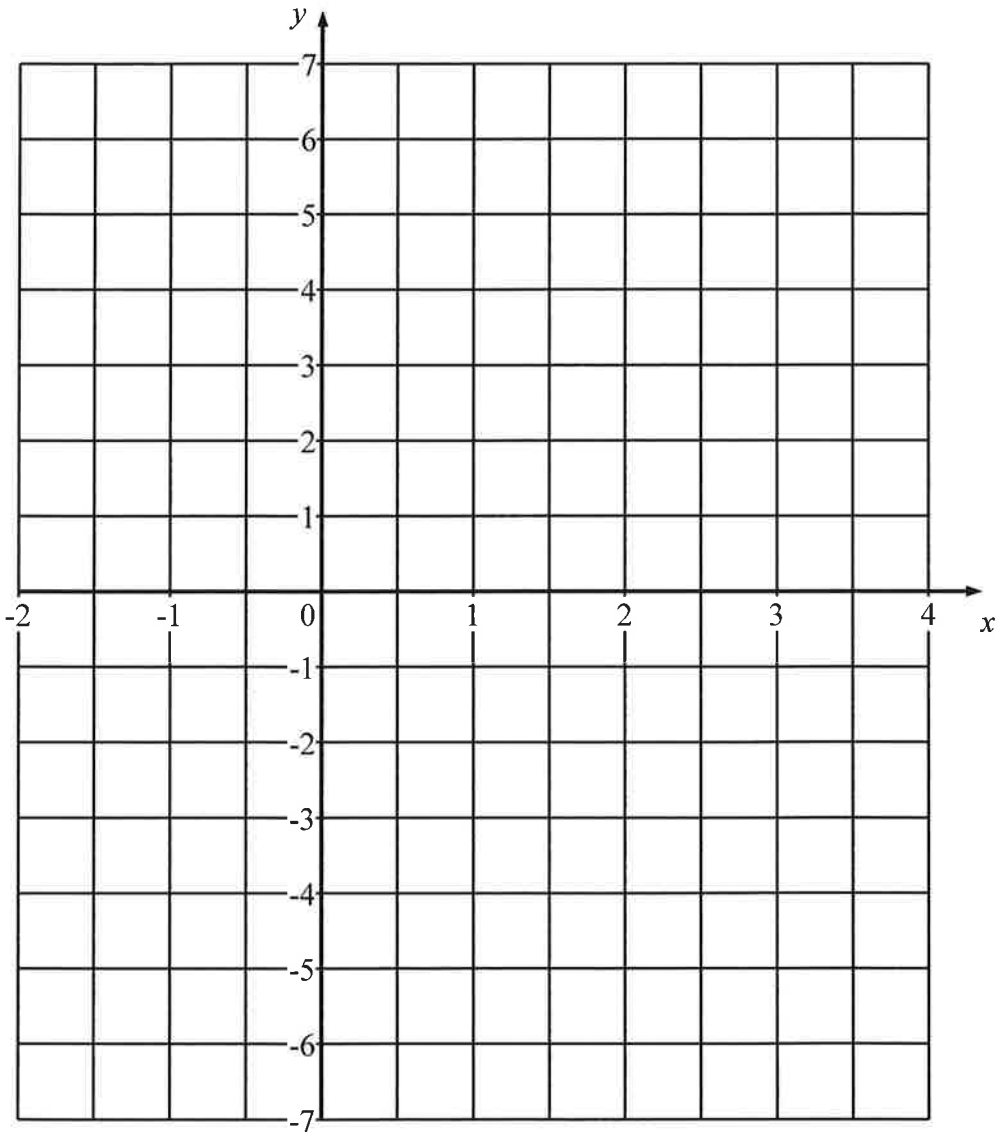
x	–2	0	4
y			6

(ii) $y = 1 - x$

x	–2	0	4
y			– 3

[2]

(b) Plot the lines $y = 2x - 2$ and $y = 1 - x$ on the grid below.



[2]

(c) Write down the coordinates of where the two lines cross.

Answer: (_____, _____) [2]

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12. Solve the following equations:

(a) $3x - 5 = 4 - 2x$

$x =$ _____ [2]

(b) $\frac{x}{3} - 1 = 7$

$x =$ _____ [2]

(c) $(2x - 1)(3x + 2) = 6x^2 - x + 2$

$x =$ _____ [3]

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13. Factorise fully:

(a) $40x^2 + 10$

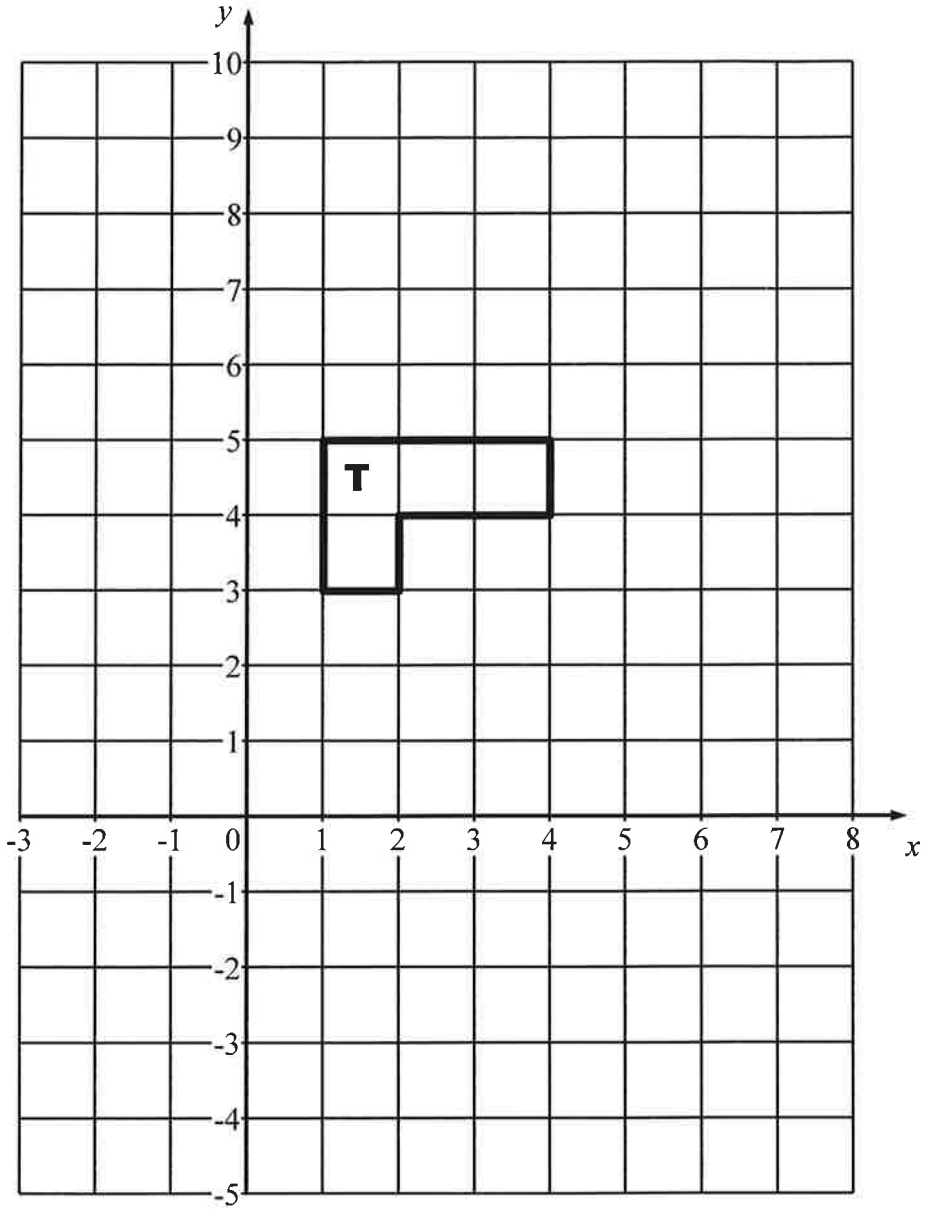
Answer: _____ [2]

(b) $35abc - 45a^2c^3$

Answer: _____ [2]

Page total:

14.



On the grid above draw the result of:

(a) translating shape T by the vector $\begin{pmatrix} -3 \\ -4 \end{pmatrix}$ labelling your answer A,

[2]

(b) rotating shape T 90° clockwise about (0,0) labelling your answer B,

[2]

(c) reflecting shape T in the line $y = x$ labelling your answer C,

[2]

(d) enlarging shape T by a scale factor of 3 with centre of enlargement (3, 3) labelling your answer D.

[2]

Page total:

15. (a) Calculate the size of an exterior angle of a regular pentagon.

Answer: _____ [2]

(b) Calculate how many sides a regular polygon has if its interior angle is equal to the exterior angle of an equilateral triangle.

Answer: _____ [3]

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16. The faces of a cube are painted so that any two faces which have an edge in common are painted different colours. Find the smallest number of colours needed to paint the cube.

Answer: _____ [2]

Page total:

17. A bag contains n balls which are red, green or blue. The probability of picking a red ball at random from the bag is $\frac{1}{6}$ and of picking a green ball is $\frac{3}{10}$. Calculate the smallest possible value of n.

Answer: _____ [2]

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18. A *palindromic* number is one which reads the same forwards as backwards.

For example, 1551 is palindromic, as is 12321.

(a) Find the next palindromic number after 1551.

Answer: _____ [1]

(b) Find the next palindromic number after 12321.

Answer: _____ [1]

(c) Calculate the sum of all of the palindromic numbers between 100 and 200.

Answer: _____ [2]

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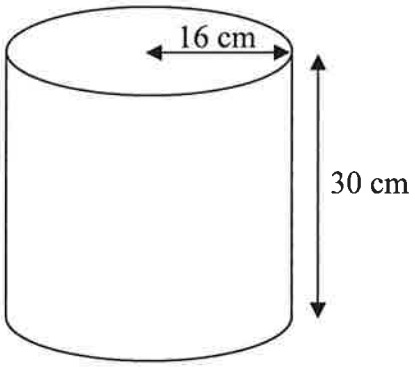
19. A cylindrical paint tin has a radius of 16 cm and a height of 30 cm.



(a) Calculate the circumference of the base, giving your answer to 1 decimal place.

Answer: _____ cm [2]

(b) Calculate the volume of the cylinder, giving your answer to the nearest whole number.

Answer: _____ cm^3 [2]

(c) Calculate the number of litres of paint that this tin contains, giving your answer to 1 decimal place.

Answer: _____ litres [2]

(d) Each litre of paint covers 10 m^2. Calculate the area of wall this can of paint covers, giving your answer in m^2 and to the nearest whole number.

Answer: _____ m^2 [2]

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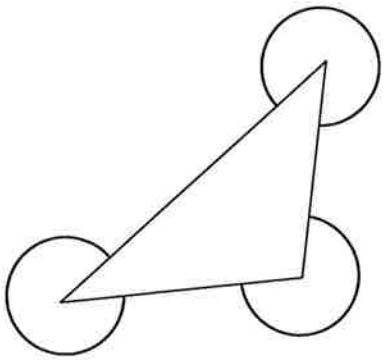
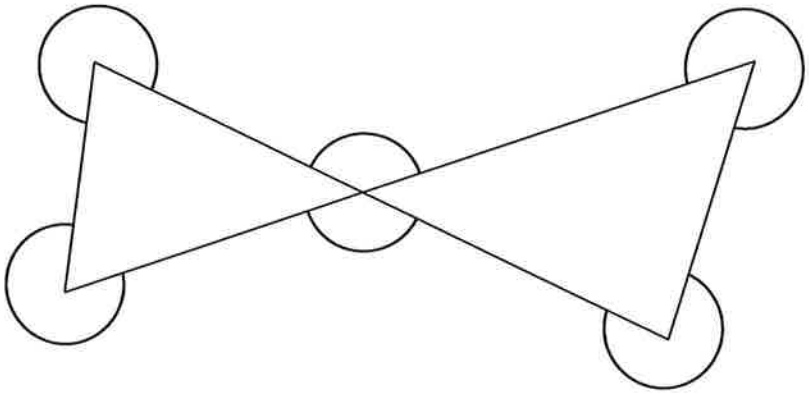
20. Calculate the sum of the angles shown in each of the diagrams:

(a)



Answer: _____ [2]

(b)



Answer: _____ [2]

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21. A new way to combine two numbers, written Δ, is defined as:

$$x \Delta y = x^2 + y^2$$

For example, $3 \Delta 5 = 34$ because $3^2 + 5^2 = 9 + 25 = 34$.

(a) Calculate:

(i) $2 \Delta 3$,

Answer: _____ [2]

(ii) $(-2) \Delta (-3)$,

Answer: _____ [2]

(iii) $3 \Delta (4 \Delta 2)$.

Answer: _____ [2]

(b) Solve:

(i) $3 \Delta x = 10$,

$x =$ _____ [2]

(ii) $x \Delta x = 242$.

$x =$ _____ [2]

Page total:

22. The 5 digit number $1a78c$ is divided by 7 and gives the 4 digit result $25b1$. Calculate the unknown digits a, b and c.

$a =$ _____ $b =$ _____ $c =$ _____ [3]

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23. Work out the dimension of a rectangle with an area of 242 cm^2 if its length and breadth are both whole numbers of centimetres, one of which is an even number and the other a prime number.

Answer: _____ cm by _____ cm [3]

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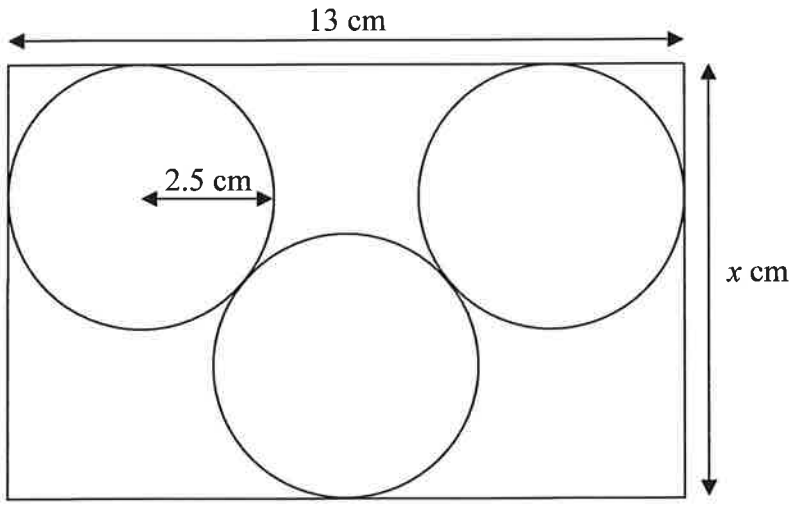
24. The diagram below shows a rectangle containing three circles each with radius 2.5 cm. The rectangle has a width of 13 cm and a height of x cm.



Calculate the value of x.

$x =$ _____ cm [3]

THE END
IF YOU HAVE TIME THEN GO BACK AND CHECK YOUR ANSWERS

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