

**A1** Solve the simultaneous equations:

$$2x + 5y - 2z = 4$$

$$7x - y + 2z = 13$$

$$9x - 4y = 1$$

Write down the value of  $\frac{z^2 - yx}{2}$ .



**A2** *T is the number that you will receive*

The expression  $\frac{T-4}{x+1} + \frac{Tx}{2x^2+7x+5}$  can be written in

the form  $\frac{px+q}{2x^2+7x+5}$ .

Write down the value of  $p$ .

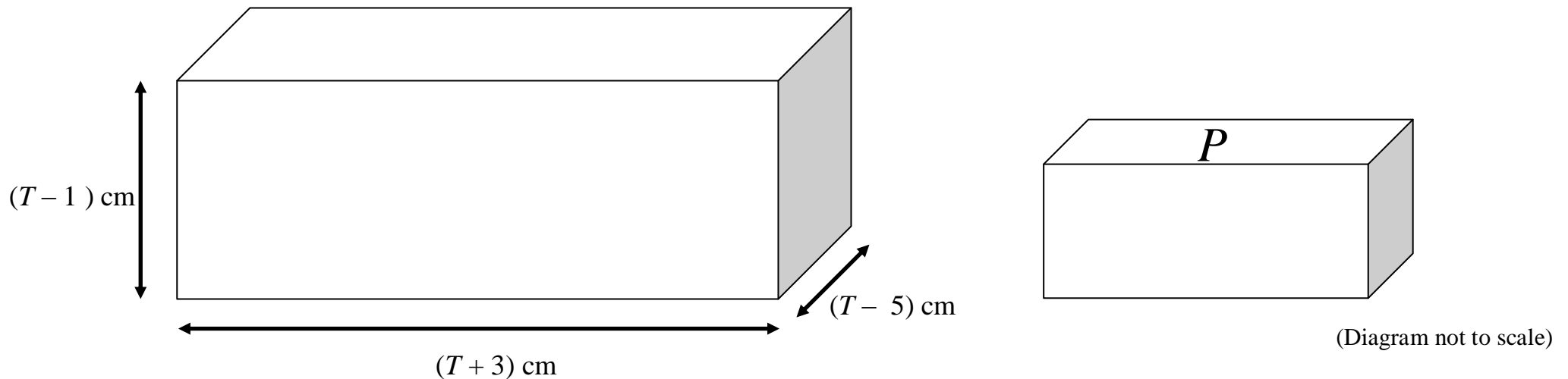


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### **A3** *T is the number that you will receive*

The ratio of the volumes of these two similar cuboids, shown similarly situated, is 64:1.

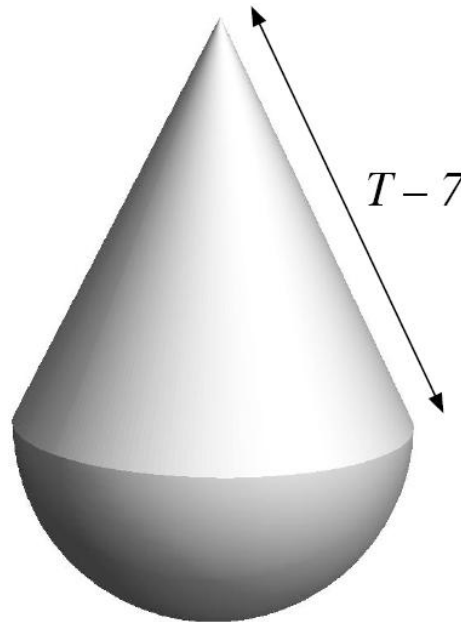


Calculate the perimeter of face  $P$ .



**A4** *T is the number that you will receive*

A solid is formed by joining a right circular cone with base of radius 3cm, to a hemisphere of radius 3cm, as shown. The cone has a slant height of  $(T - 7)$  cm. Calculate the volume of the solid in terms of  $\pi$ .



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**B1** Given that

$$125 = 5^{4x+1}$$

calculate the value of  $x$ .



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**B2** *T* is the number that you will receive

The equation  $(2^{2x}) - 5(2^x) + 4 = 0$  has two solutions, *a* and *b*.

Using the substitution  $y = 2^x$  or otherwise,

calculate  $T(a + b)$ .



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**B3** *T is the number that you will receive*

$$\text{Let } x = \frac{2\sqrt{3} + T}{T} \div \frac{T}{2\sqrt{3} - T} .$$

Calculate the value of  $x$ .



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**B4** *T is the number that you will receive*

$$\text{Let } A = \sqrt{11T} + \sqrt{75} - T\sqrt{12}.$$

*A can be written in the form  $a + b\sqrt{c}$ , where  $a$ ,  $b$  and  $c$  are integers.*

*Write  $A$  in the form  $a + b\sqrt{c}$ .*



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# C1

$2y + x + 4 = 0$  is the equation of the line  $L_1$

$y + 5x = 2$  is the equation of the line  $L_2$

$y = ax + b$  is the equation of the line  $L_3$

The line  $L_3$  passes through the  $y$ -intercept of  $L_1$  and the  $x$ -intercept of  $L_2$ .

Calculate  $ab$ .



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**C2**  $T$  is the number that you will receive

The coordinates  $\left(T, \frac{T}{2}\right)$ ,  $\left(0, \frac{T}{10}\right)$ ,  
 $\left(0, \frac{-T}{10}\right)$  and  $(T, 0)$  give the vertices  
of a quadrilateral.

Calculate the area of this quadrilateral.



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**C3** *T is the number that you will receive*

The graphs with equations  $y = 2x^2 + x + T$   
and  $y = 6x + 33$  intersect at two points,  
 $(x_1, y_1)$  and  $(x_2, y_2)$ .

Calculate the difference between  $x_1$  and  $x_2$ .



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**C4** *T is the number that you will receive*

The circle  $x^2 + y^2 + 8Tx - 6Ty - 8 = 0$   
intersects the line  $y = 2x$  at points  $(x_1, y_1)$  and  
 $(x_2, y_2)$ .

Calculate  $x_1 + x_2$ .



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# D1

The digits of 2008 can be arranged in different orders, for example 0208.

In how many different orders can these digits be arranged?



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**D2** *T is the number that you will receive*

A combination lock has  $(T \div 3)$  digits, where each digit is one of 0-9. Burglar Bill attempts every possible combination in sequence.

It takes him 2 seconds to try each combination.

Calculate, to the nearest hour, the longest time it could take him to open the safe.



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**D3** *T is the number that you will receive*

Worthington-upon-Mud has a tug-of-war squad of 10 men. A team of  $(T + 2)$  men is needed for their next event.

How many different teams could be selected?



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**D4** *T* is the number that you will receive

$(T \div 5)$  people are in a room.

Everyone shakes everyone else's hand once.

Calculate the total number of handshakes.

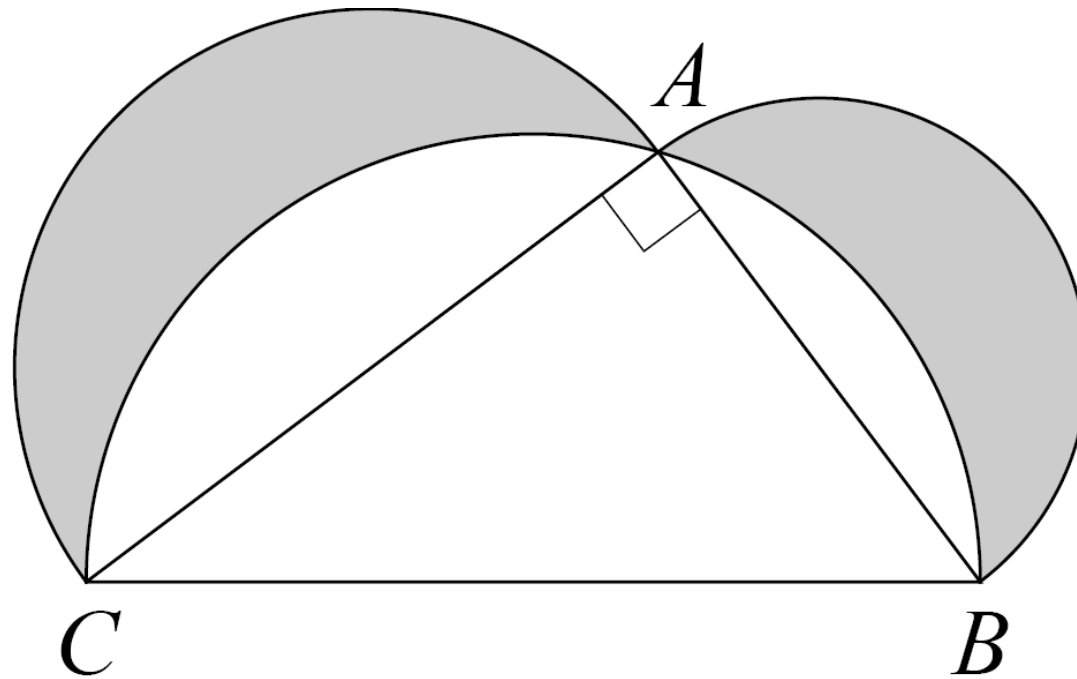


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# E1

Triangle  $ABC$  has a right-angle at  $A$ . Semicircles are drawn with  $BA$ ,  $AC$  and  $BC$  as diameters as shown. Given that  $AC = 8$  and  $BC = 10$ , write down the value of one third of the total shaded area.



**E2** *T is the number that you will receive*

The value of  $\frac{T}{3-\sqrt{5}}$  can be expressed in the form  $a+b\sqrt{5}$ , where  $a$  and  $b$  are integers.

Write down the value of  $8(a - b)$ .



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**E3** *T* is the number that you will receive

A parallelogram  $ABCD$  is such that

$$\angle DAB = (2w - 70)^\circ,$$

$$\angle BCD = (w + 30)^\circ, \text{ and}$$

$$\angle ABC = \angle CDA = (x + T)^\circ.$$

Write down the value of  $x + 6$  .



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**E4** *T is the number that you will receive*

The angles of a certain hexagon form an arithmetic sequence with common difference  $\frac{1}{2}T$ .

Write down the size, in degrees, of the smallest angle of the hexagon.



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**F1** Write down the value of

$$\frac{48}{\sqrt{16}^{\frac{3}{2}}} - 3^{\frac{1}{2}} \left( \sqrt{\frac{4 + \sqrt{4}}{2}} \right)$$



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**F2** *T is the number that you will receive*

A cylinder of radius 4cm and height  $(T + 6)$ cm has the same volume as a different cylinder of radius  $(4 + y)$ cm and height  $(T - 2)$ cm.

Calculate the value of  $y$ .



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**F3** *T is the number that you will receive*

Given that

$$(T + 16)c + 7d = 4$$

$$d + e = 20$$

$$e + f = 36$$

$$f + 5c = 15$$

find the value of  $c$ .

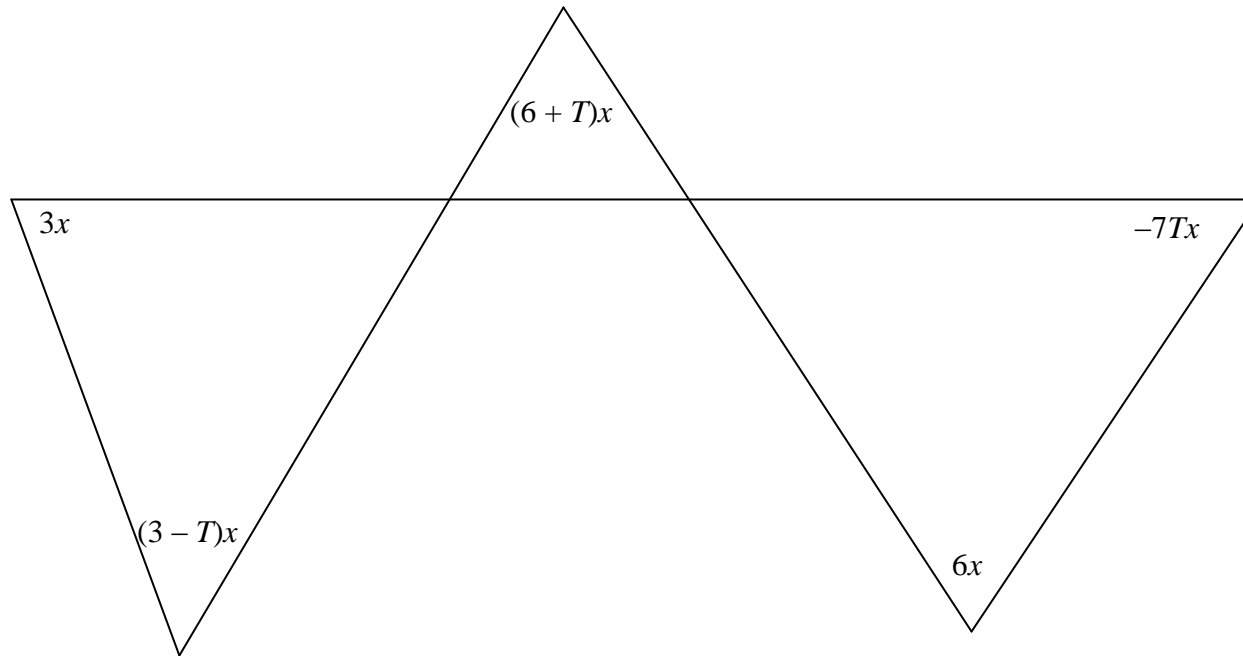


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**F4** *T is the number that you will receive*

In the diagram, all angles are measured in degrees. Write down the value of  $x$ .



(Diagram not to scale)



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# Answers

	Question 1	Question 2	Question 3	Question 4
Relay A	7	13	12	$30\pi$
Relay B	$\frac{1}{2}$	1	11	$11-17\sqrt{3}$
Relay C	-10	35	1.5	1.2 or $\frac{6}{5}$
Relay D	12	6	45	36
Relay E	8	32	24	$90^\circ$
Relay F	3	8	-1	12



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