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**H**

# Thursday 28 February 2013 – Afternoon

## GCSE MATHEMATICS B

**J567/03** Paper 3 (Higher Tier)

*J536103133*

Candidates answer on the Question Paper.

**OCR supplied materials:**
None

**Other materials required:**
- Geometrical instruments
- Tracing paper (optional)

**Duration:** 1 hour 45 minutes

*J567703*

| Candidate forename | | Candidate surname | |
|---|---|---|---|

| Centre number | | | | | | Candidate number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

**WARNING**

**No calculator can be used for this paper**

This paper has been pre modified for carrier language

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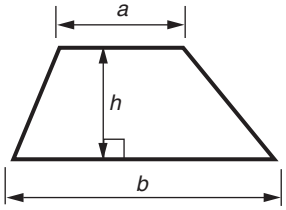
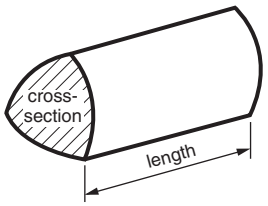
# Formulae Sheet: Higher Tier

**Area of trapezium** $= \frac{1}{2}(a + b)h$




**Volume of prism** = (area of cross-section) × length

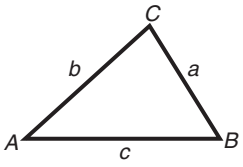



**In any triangle *ABC***

**Sine rule** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

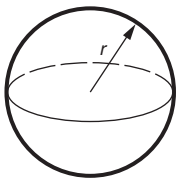
**Cosine rule** $a^2 = b^2 + c^2 - 2bc\cos A$

**Area of triangle** $= \frac{1}{2}ab\sin C$



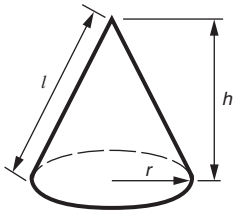

**Volume of sphere** $= \frac{4}{3}\pi r^3$

**Surface area of sphere** $= 4\pi r^2$




**Volume of cone** $= \frac{1}{3}\pi r^2 h$

**Curved surface area of cone** $= \pi rl$




**The Quadratic Equation**

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

**PLEASE DO NOT WRITE ON THIS PAGE**

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**1** One day 300 people visit a museum.
The ratio of adults to children is 2 : 3.

**(a)** Work out the number of adults and the number of children.

**(a)** Adults _____ Children _____ **[2]**

**(b)** This two-way table summarises some information about the visitors to the museum.

**(i)** Complete the table.

| | Adults | Children | Total |
|---|---|---|---|
| Male | | | 132 |
| Female | | 100 | |
| Total | | | 300 |

**[1]**

**(ii)** One of the adults is chosen at random.

Find the probability that the adult is a male.

**(b)(ii)** _____ **[2]**

**(iii)** Find the ratio of male to female visitors.
Write the ratio in its simplest form.

**(iii)** _____ : _____ **[2]**

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**2** *Fresh Clean* and *Cleanup* are two home cleaning companies.

**(a)** *Fresh Clean* charges £3.50 for each room they clean and an extra £15 call out charge. Write down a formula for the total charge, £$F$, for cleaning a house with $n$ rooms.

**(a)** _____ **[2]**

**(b)** *Cleanup* uses this formula to work out the total charge to clean a house.

$$C = 25h + 10$$

$C$ is the total charge in £ for a clean taking $h$ hours.

Pete's house has 8 rooms and will take $1\frac{1}{2}$ hours to clean.

Which of the two cleaning companies, *Fresh Clean* or *Cleanup*, will be cheaper and by how much?

**(b)** _____ by £ _____ **[3]**

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**3** **(a)** Multiply out.

$a(3 + a)$

**(a)** _____ **[1]**

**(b)** Factorise.

$4b - 12$

**(b)** _____ **[1]**

**(c)** Rearrange this formula to make $p$ the subject.

$T = 4p + 5$

**(c)** $p =$ _____ **[2]**

**(d)** Solve this inequality.

$3x - 6 < x + 4$

**(d)** _____ **[3]**

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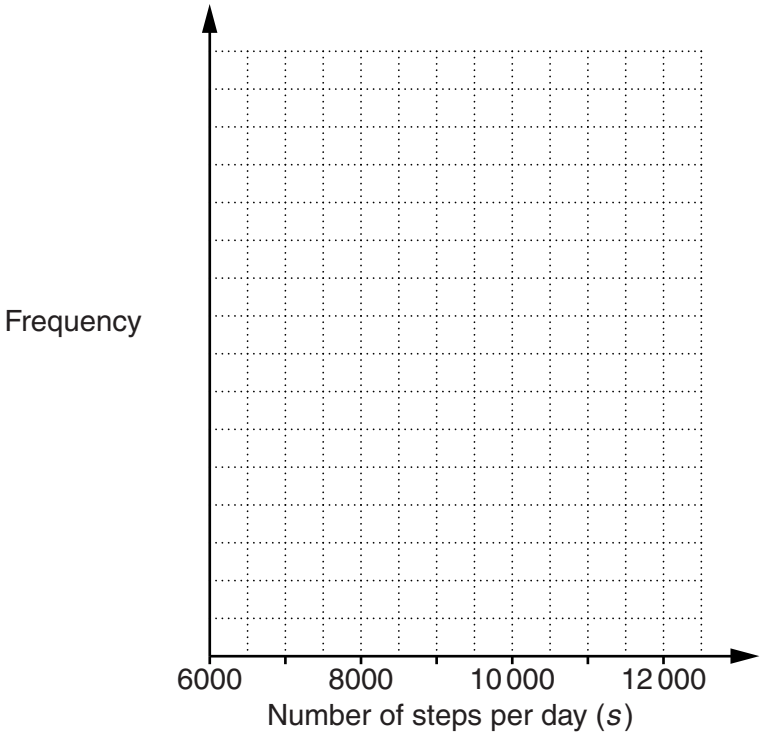
**4** Sofia uses a pedometer to record the number of steps she takes each day for one month. Her results are summarised in the table below.

| Steps per day ($s$) | Frequency |
|---|---|
| $6000 \leqslant s < 7000$ | 3 |
| $7000 \leqslant s < 8000$ | 4 |
| $8000 \leqslant s < 9000$ | 6 |
| $9000 \leqslant s < 10\,000$ | 8 |
| $10\,000 \leqslant s < 11\,000$ | 7 |
| $11\,000 \leqslant s < 12\,000$ | 2 |

**(a)** Draw a frequency polygon to display this information.




**[3]**

**(b)** Write down the modal class of the number of steps per day.

**(b)** _____ **[1]**

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**(c)** Sofia reads that taking at least 10 000 steps per day is an important part of a healthy lifestyle.

For what percentage of the month did she meet this target?

**(c)** _____ % **[2]**

**(d)** One day Sofia goes for a walk in the hills.
The length of the walk is 7 km, correct to the nearest kilometre.

What is the longest possible length of Sofia's walk?

**(d)** _____ km **[1]**

**5** Kate thinks of a number.
She multiplies it by 3 and then adds 3.

Leo thinks of the same number as Kate.
He subtracts 5 and then multiplies the result by 6.

Kate and Leo both end up with the same number.

Find the numbers that they start and end with.

Start _____

End _____ **[4]**

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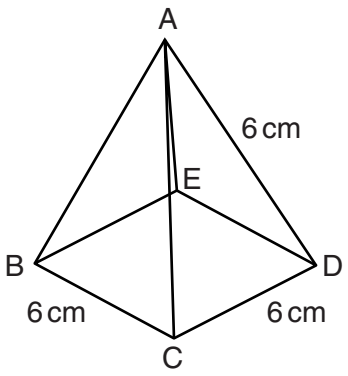
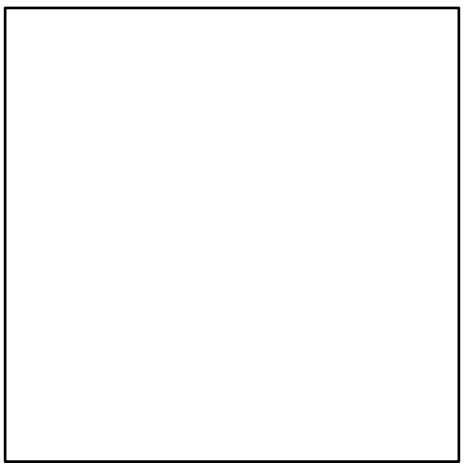
**6** ABCDE is a square-based pyramid.
The length of each edge is 6 cm.




**(a)** Construct a full-size net of the pyramid.
The base is drawn for you.



**[2]**

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**(b)** Use measurements from your diagram to calculate the total surface area of the pyramid.

**(b)** _____ $cm^2$ **[4]**

**7** **(a)** The price of a printer is £64.50 excluding VAT.

Calculate the price of the printer including VAT at 20%.

**(a)** £ _____ **[3]**

**(b)** The price of a season ticket is increased by 10% in January 2012 and then by another 10% in January 2013.

Calculate the overall percentage increase in the price of the season ticket.

**(b)** _____ % **[3]**

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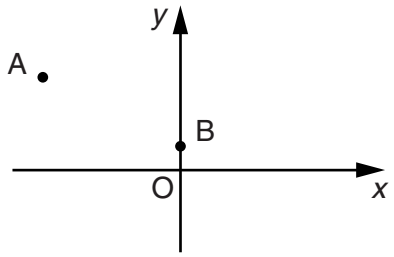
**8** **(a)** Find the size of the exterior angle of a regular 12-sided polygon.

**(a)** _____ ° **[2]**

**(b)** Hence find the size of the interior angle of a regular 12-sided polygon.

**(b)** _____ ° **[1]**

**9** In the sketch below, A is the point ($^{-}10$, 8) and B is the point (0, 3).




**(a)** Find the coordinates of the midpoint of the line AB.

**(a)** ( _____ , _____ ) **[2]**

**(b)** Find the equation of the line AB.

**(b)** _____ **[3]**

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**10** **(a)** Work out.

$$2\frac{2}{5} \div 2\frac{1}{4}$$

Give your answer as a mixed number in its simplest form.

**(a)** _____ **[3]**

**(b)** Write down the reciprocal of 5.

**(b)** _____ **[1]**

**(c)** Write as a single power of 5.

$$5^{6} \div 5^{-3}$$

**(c)** _____ **[1]**

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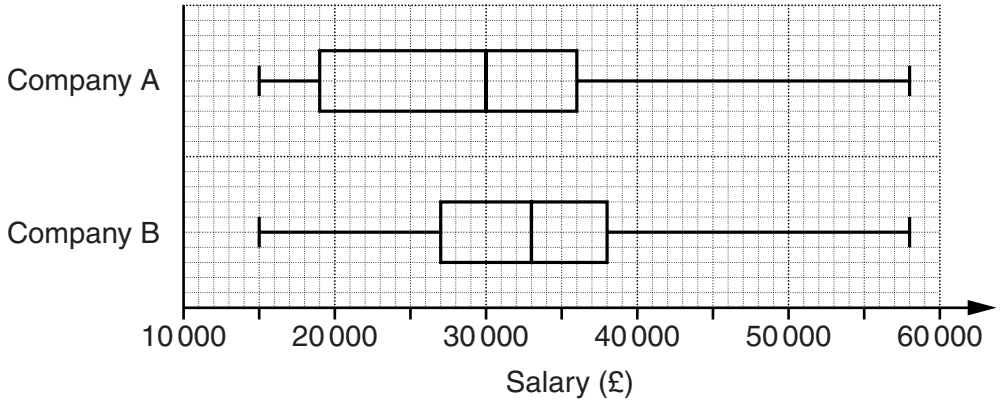
**11** These box plots represent data for the salaries of the employees working in two companies.




**(a)** Find the median for company A.

**(a)** £ _____ **[1]**

**(b)** Find the interquartile range for company B.

**(b)** £ _____ **[2]**

**(c)** Make two different comparisons between the salaries in the two companies.

1 _____

_____

2 _____

_____ **[2]**

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**12** State which calculation, in each of the following pairs, has an incorrect answer.
Explain how you can tell without giving the correct answer.

**(a)**

| | |
|---|---|
| A | $300 \times 4000 = 12\,000$ |
| B | $0.003 \times 0.04 = 0.00012$ |

Calculation _____ has an incorrect answer

because _____ **[1]**

**(b)**

| | |
|---|---|
| C | $6497 \times 1.08 = 7016.76$ |
| D | $5684 \div 0.96 = 5456.64$ |

Calculation _____ has an incorrect answer

because _____ **[1]**

**(c)**

| | |
|---|---|
| E | $5.8 \times 10^{-3} \times 1.2 \times 10^{-2} = 6.96 \times 10^{-5}$ |
| F | $4.6 \times 10^{8} \div 3.7 \times 10^{2} = 1.24 \times 10^{4}$ |

Calculation _____ has an incorrect answer

because _____ **[1]**

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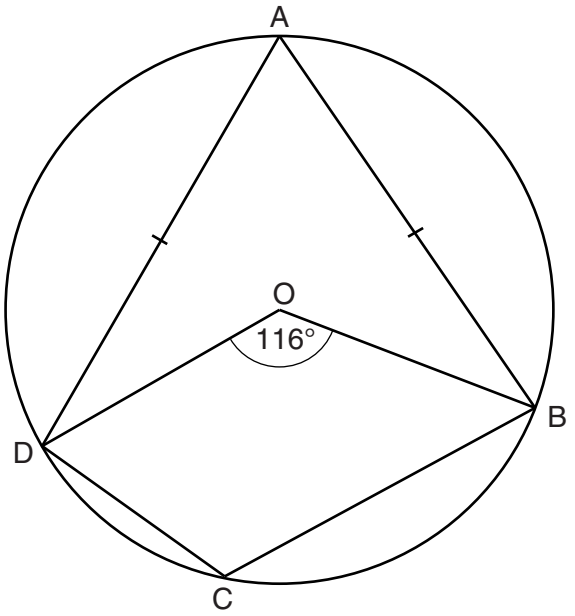
**13** In the diagram, A, B, C and D are points on the circle centre O.
AB = AD and angle BOD = 116°.




**Not to scale**

Calculate

**(a)** angle BAD,

**(a)** _____ ° **[1]**

**(b)** angle BCD,

**(b)** _____ ° **[1]**

**(c)** angle ABO.

**(c)** _____ ° **[2]**

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**14** **(a)** Solve algebraically these simultaneous equations.

$6x + 2y = 5$
$4x - 5y = 16$

**(a)** $x =$ _____

$y =$ _____ **[4]**

**(b)** Factorise and solve.

$6x^2 + 11x - 10 = 0$

**(b)** $x =$ _____ and $x =$ _____ **[3]**

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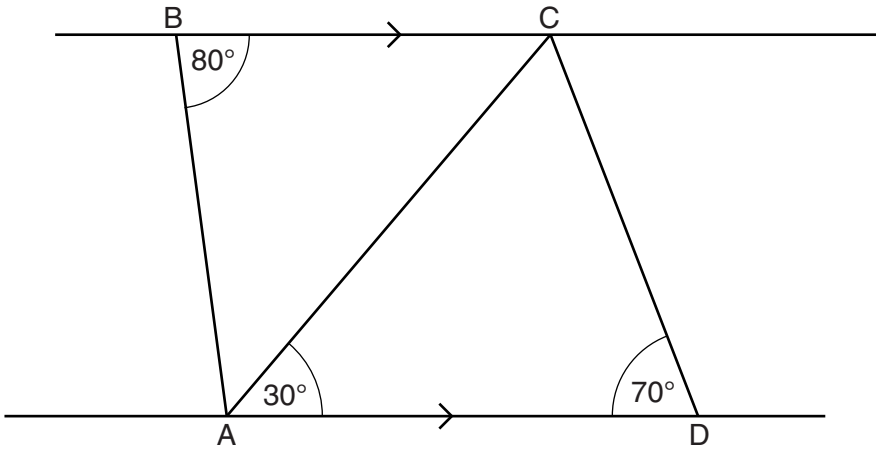
**15** **(a)** A photo is 12 cm wide by 10 cm high.
An enlargement of the photo is 15 cm wide.

Calculate the height of the enlargement.

**(a)** _____ cm **[3]**

**(b)** In the diagram, AD is parallel to BC.
Angle ABC = 80°, angle CAD = 30° and angle ADC = 70°.




**Not to scale**

Show that triangles ABC and DCA are similar.

_____

_____

_____

_____

_____ **[3]**

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**16** Vector $\mathbf{p} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$ and vector $\mathbf{q} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$.

Calculate.

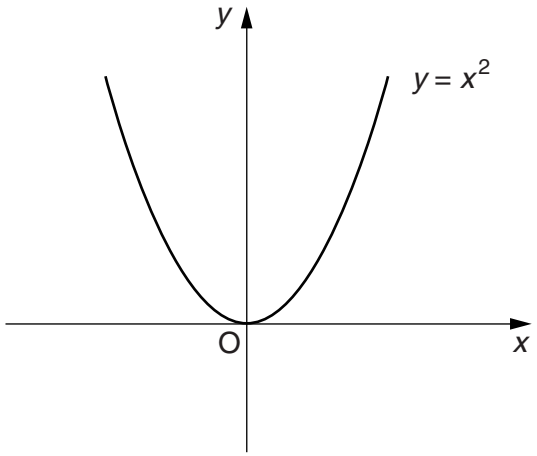
**(a)** $\mathbf{p} + \mathbf{q}$

**(a)** $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[1]**

**(b)** $3\mathbf{p} - \mathbf{q}$

**(b)** $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[2]**

**17** This sketch shows the graph of $y = x^2$.




**(a)** On the same axes, sketch the graph of $y = 2x^2$. **[1]**

**(b)** Describe the transformation that maps the graph of $y = x^2$ onto $y = x^2 - 3$.

_____ **[2]**

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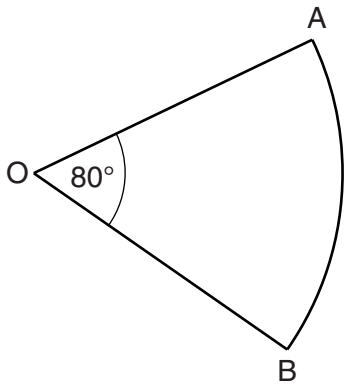
**18** Simplify.

$$\frac{6 + \sqrt{2}}{\sqrt{2}}$$

Give your answer in the form $a\sqrt{2} + b$.

_____ **[3]**

**19** OAB is a sector of a circle.
Angle AOB = 80°.




**Not to scale**

The length of arc AB is $12\pi$ cm.

Find the perimeter of the sector.
Give your answer in the form $a + b\pi$.

_____ **[4]**

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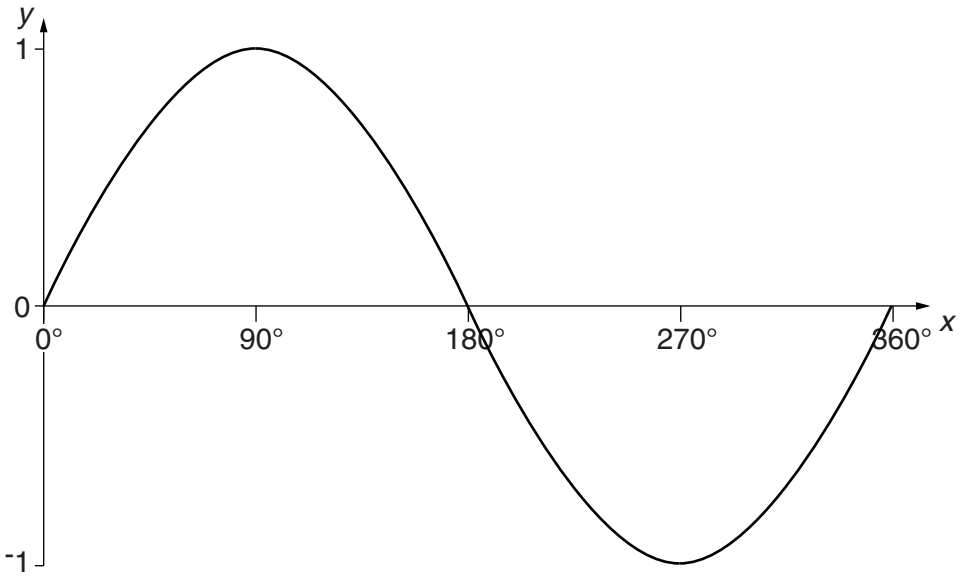
**20** The diagram shows the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.




One solution to the equation $\sin x = 0.8$ is $x = 53°$, correct to the nearest degree.

Find the values of $x$ which satisfy $\sin x = -0.8$ in the range $0° \leqslant x \leqslant 360°$.

$x =$ _____ **[2]**

**TURN OVER FOR QUESTION 21**

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**21*** Jamie organises a game to raise money for charity.

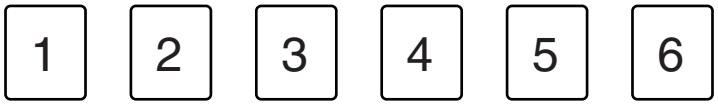
**Number Generator Game**

£1 per go

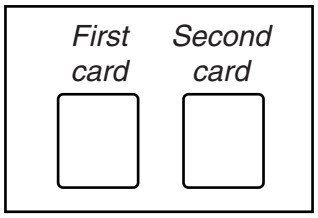
Pick 2 cards

Win £5
for a number greater than 55

He shuffles these six cards and places them face down on a table.




Players pick a card at random and place it in the *First card* position on the grid below.
They then pick a second card at random and place it in the *Second card* position on the grid.




Explain why £5 may not be an appropriate prize for this game.

_____

_____

_____

_____

_____

_____ **[5]**

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