



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education  
Advanced Subsidiary Level and Advanced Level

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**THINKING SKILLS**

**9694/12**

Paper 1 Problem Solving

**May/June 2013**

**1 hour 30 minutes**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)



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**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

There are **30** questions on this paper. Answer **all** the questions.

For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in pencil on the separate answer sheet.

**Read very carefully the instructions on the answer sheet. Ignore responses numbered 31 – 40 on the answer sheet.**

**INFORMATION FOR CANDIDATES**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

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This document consists of **16** printed pages.



- 1 The hardware superstore is selling the paint I want at “3 tins for the price of 2”. This weekend I can get a further 10% off with my loyalty card.

What will be the overall reduction from the full price if I buy three tins of paint this weekend?

- A 40%
- B 43%
- C 55%
- D 60%
- 2 The table below shows the dates of the reigns of the monarchs of Portugal from 1640 to the abolition of the monarchy in 1910. (Where the dates overlap, this indicates a King and Queen ruling together.)

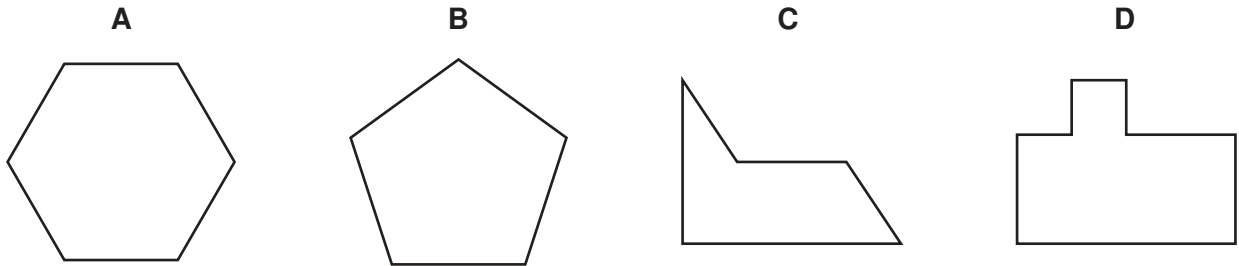
<i>Monarch</i>	<i>Start date</i>	<i>End date</i>
João IV	15 December 1640	06 November 1656
Afonso VI	06 November 1656	12 September 1683
Pedro II	12 September 1683	09 December 1706
João V	09 December 1706	31 July 1750
José	31 July 1750	24 February 1777
Maria I	24 February 1777	20 March 1816
Pedro III	24 February 1777	25 May 1786
João VI	20 March 1816	10 March 1826
Pedro IV	10 March 1826	05 May 1826
Maria II	05 May 1826	30 June 1828
Miguel	30 June 1828	26 May 1834
Maria II (again)	26 May 1834	15 November 1853
Fernando II	16 September 1837	15 November 1853
Pedro V	15 November 1853	11 November 1861
Luís	11 November 1861	19 October 1889
Carlos	19 October 1889	01 February 1908
Manuel II	01 February 1908	05 October 1910

Which monarch ruled for the longest?

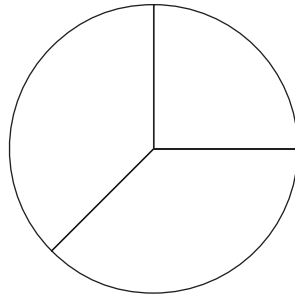
- A Afonso VI
- B João V
- C Luís
- D Maria I

- 3 Ying wants to tile his kitchen floor and is trying to decide between his four favourite tiles. However, only three of them are suitable for the job as one of them won't cover the floor without leaving numerous gaps.

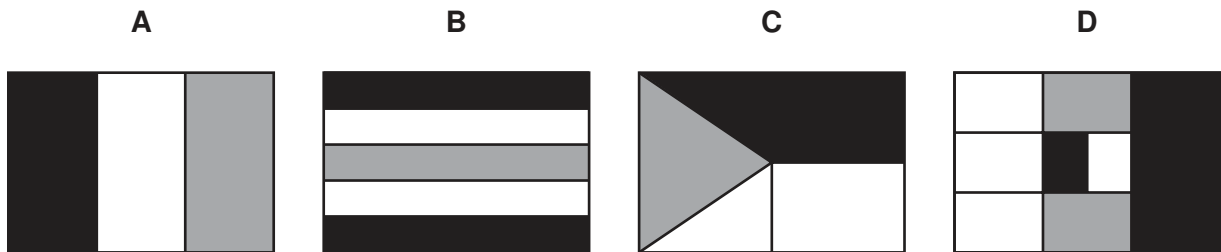
Which one is it?



- 4 The pie chart below represents the relative areas that different colours occupy on a flag.



Which one of the following flags would yield a similar pie chart to the one above?



5

<i>CO<sub>2</sub></i> <i>emissions</i> <i>(g/km)</i>	<i>Tax 2011 (\$)</i>	<i>CO<sub>2</sub></i> <i>emissions</i> <i>(g/km)</i>	<i>Tax 2012 (\$)</i>	<i>Tax 2013 (\$)</i>
Up to 100	0	Up to 100	0	0
101–120	35	101–110	35	20
121–150	120	111–120	35	35
151–165	145	121–130	120	90
166–185	170	131–140	120	105
186–225	210	141–150	125	125
Over 225	400	151–165	150	155
		166–175	175	180
		176–185	175	200
		186–200	215	235
		201–225	215	245
		Over 225	405	425

In New Ecoland car owners pay a yearly tax on their vehicles that depends on how much carbon dioxide (CO<sub>2</sub>) is emitted by the vehicle per kilometre travelled. The first two columns in the table above show how the tax depends upon emissions for 2011. For 2012 and 2013 the authorities are dividing the emission bands into smaller ranges, and the final three columns show the taxes for 2012 and 2013.

Daphne owns two cars, an Adoks Retsmoor (CO<sub>2</sub> emission 125 g/km) and a WMB d525 (CO<sub>2</sub> emission 180 g/km).

Over the three years (2011, 2012 and 2013), how much more tax will Daphne pay on the WMB than the Adoks?

- A** \$150
- B** \$165
- C** \$215
- D** \$330

- 6 A group of 6 people, including 5 senior citizens, go to a restaurant for a meal.

3 people have meals costing \$12 each  
 2 people have meals costing \$13 each  
 1 person has a meal costing \$14

The restaurant has two special offers:

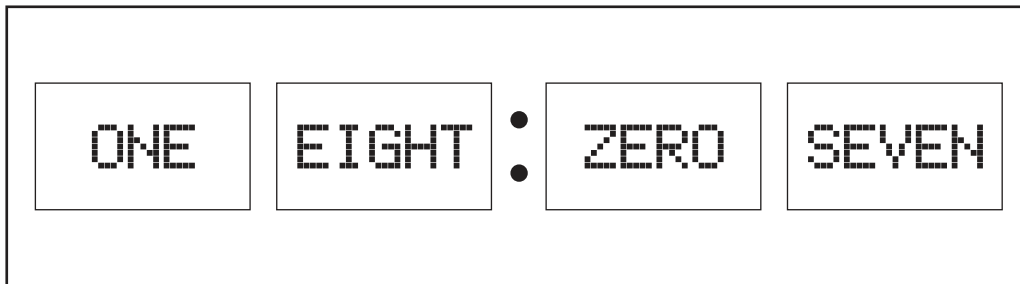
- Groups of 6 or more can have one of the cheapest meals free.
- Senior citizens get a reduction of \$2.50 each.

Only one special offer may be used at a time.

If they take the better special offer for the group, how much is the total bill?

- A \$51.50  
 B \$63.00  
 C \$63.50  
 D \$64.00
- 7 The individual digits on my digital clock appear as words rather than numerals.

For example, at 18:07 the display is as shown below.



How many times each day does the letter E **not** appear on the display?

- A 3  
 B 6  
 C 7  
 D 9

- 8 An eccentric engraver charges according to the particular letters that she has to engrave. She puts the lowercase letters of the alphabet into these categories:

<b>Type 1</b>	a, c, e, i, n, o, r, s, u, v, x, z
<b>Type 2</b>	m, w
<b>Type 3</b>	b, d, f, h, k, l, t
<b>Type 4</b>	g, j, p, q, y

She charges as follows:

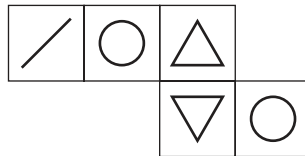
- 10 cents for every Type 1 letter that is followed by a Type 1 or Type 2 letter
- 15 cents for every Type 1 letter that is not followed by a Type 1 or Type 2 letter
- 20 cents for every Type 2 letter
- 25 cents for every Type 3 letter that is followed by a Type 1 letter
- 30 cents for every Type 3 letter that is not followed by a Type 1 letter
- 35 cents for every Type 4 letter
- 40 cents for every capital letter, regardless of its Type

I want to have this word engraved:

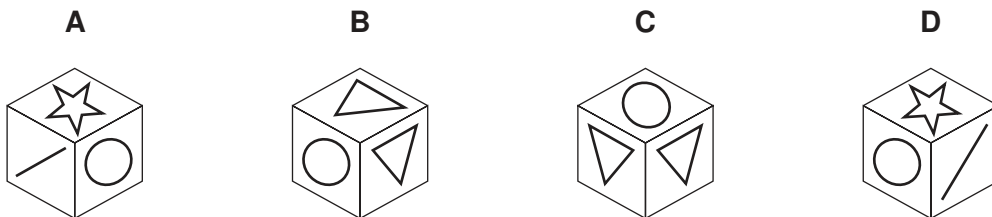
Sweetie

How much will this cost?

- A 95 cents
  - B 105 cents
  - C 120 cents
  - D 135 cents
- 9 One square has been removed from a net of a cube. The remaining five squares are shown below.



Which one of the cubes shown below can **not** have been made from the full net?

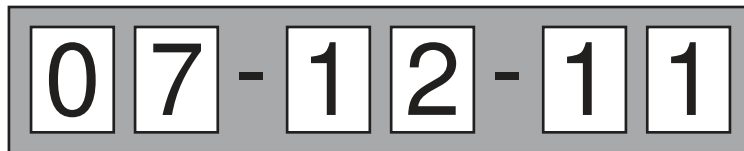


- 10 Peter's Pizza Shop calculates the price for its pizzas by charging either \$4 or \$9 for the base (depending on whether it is a small or large pizza) and then adding 80¢ for each meat topping (chicken, ham, bacon or beef) and 40¢ for anything else. If an individual pizza costs more than \$10 then its price is reduced by 10%. Delivery of the order costs \$5 regardless of the number of pizzas.

I want to buy a large pizza with chicken, bacon and mushrooms and a small pizza with ham and mushrooms, and have them delivered.

How much will I have to pay?

- A \$19.08  
 B \$19.58  
 C \$20.10  
 D \$21.20
- 11 A 'perpetual calendar' consists of 6 slots in a holder into which numbered cards are placed.



The year is shown by two digits (e.g. 2013 would be shown as "13"). If the day or month has just one digit, it is shown, for example, as "07".

If this is to be genuinely perpetual (i.e. to work for any future date), which row of the following table correctly shows the minimum number of each card needed?

	Card									
	0	1	2	3	4	5	6	7	8	9
A	3	5	5	5	5	5	5	5	5	5
B	3	5	5	4	4	4	4	4	4	4
C	4	6	5	4	4	4	4	4	4	4
D	4	6	4	4	4	4	4	4	4	4

- 12 Deena takes 15 minutes to cycle to school, and her brother Callum walks there taking 30 minutes. Normally, Deena leaves home 6 minutes after Callum.

For how long does Deena cycle until she catches up with Callum?

- A 6 minutes  
 B 9 minutes  
 C 12 minutes  
 D 15 minutes

- 13 *Tops* and *tips* are the only two ways of scoring points in the sport of T-Ball. In a thrilling T-Ball match this afternoon the Eagles beat the Panthers 48 – 47. The Panthers had taken the lead in the third minute, scoring what proved to be the only *top* of the day. They then led right up to the last play of the game, which resulted in a victory-snatching *tip* for the Eagles.

Which one of the following could **not** be T-Ball's scoring system?

- A A *top* scores 5 points, a *tip* scores 2 points.  
B A *top* scores 5 points, a *tip* scores 3 points.  
C A *top* scores 7 points, a *tip* scores 2 points.  
D A *top* scores 7 points, a *tip* scores 3 points.
- 14 I have forgotten the 4-digit PIN for my cash card. Each of the four digits can be 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9.

However, I do remember these four facts:

- The second and third digits are the same.
- The first digit is one less than the fourth digit.
- The total of all four digits is 7.
- The third digit is larger than the fourth digit.

What is the last digit in my PIN?

- A 0  
B 1  
C 3  
D 4



- 15 Geoffrey's mobile phone provider offers a choice of four plans. In each case there is a fixed price per month and a number of free minutes included in the price. There is then a fixed price for any further minutes used. The options are listed in the table below.

<i>Plan</i>	<i>Price per month (\$)</i>	<i>Number of free minutes</i>	<i>Price per additional minute (¢)</i>
Cat	30	300	10
Dog	30	450	20
Horse	50	300	5
Llama	50	450	15

It has now been announced that all of the prices per month will increase by \$5 and all of the prices for additional minutes will increase by 5¢. Geoffrey's last bill was \$70, but it would have been \$85 with the new prices.

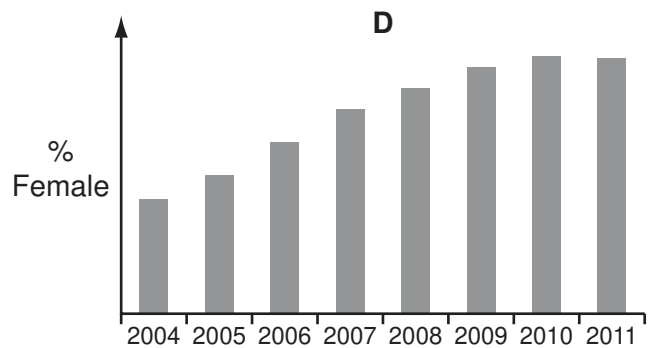
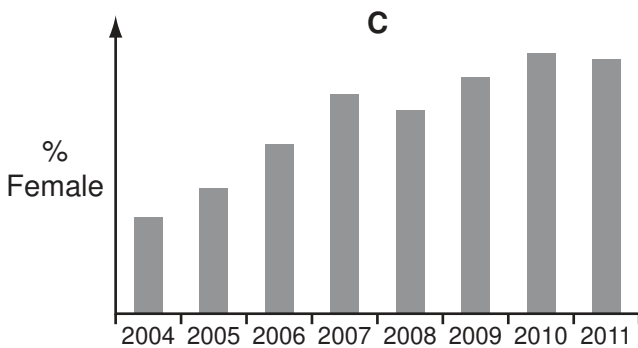
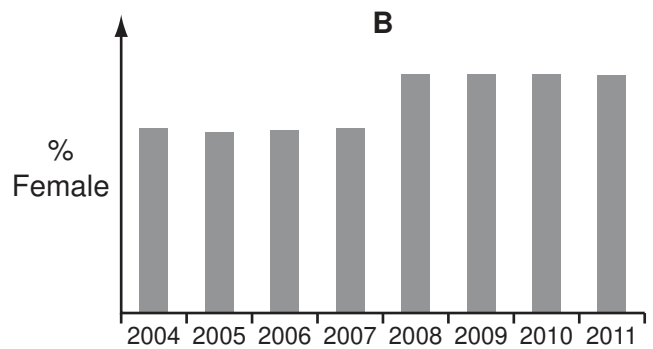
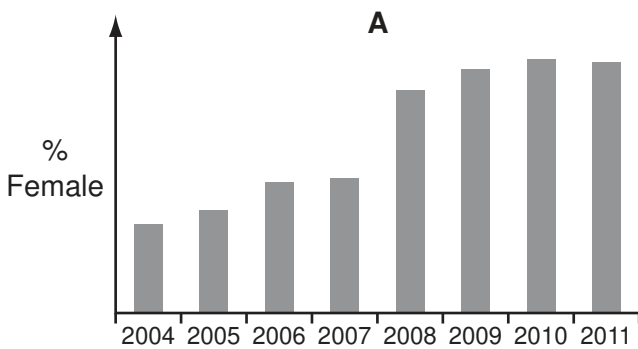
Which plan is Geoffrey currently using?

- A Cat
- B Dog
- C Horse
- D Llama

16 Central College started taking female students in 2004, having previously been all male. The numbers of male and female students admitted for subsequent years are shown in the table below:

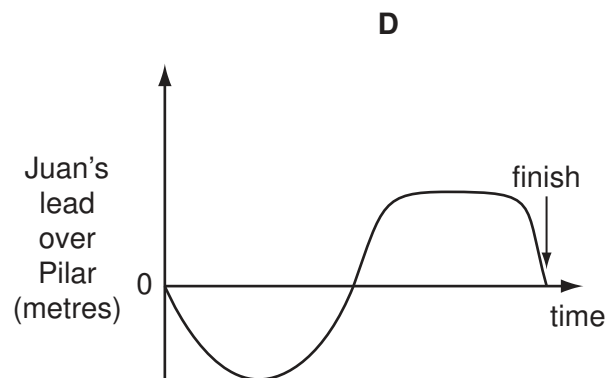
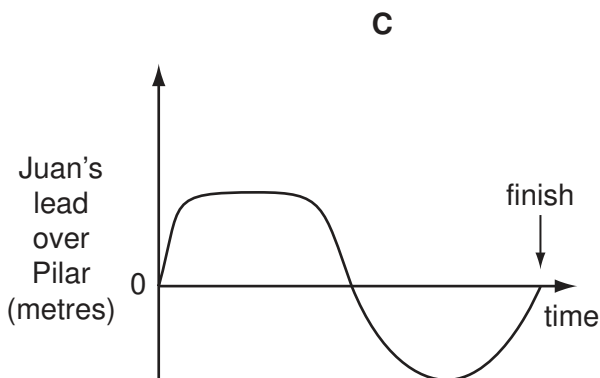
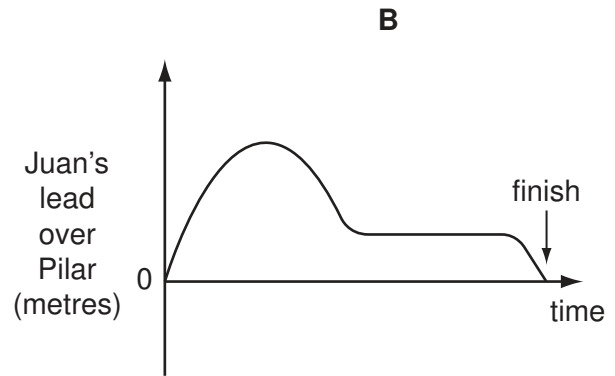
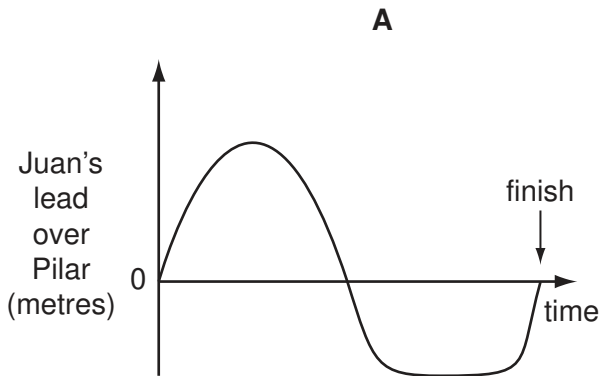
Year	Male	Female
2004	120	35
2005	111	41
2006	102	52
2007	93	62
2008	111	89
2009	104	97
2010	99	101
2011	100	100

Which of the following graphs shows the percentage of students admitted in each year that were female?



- 17 Juan and Pilar have a cycle race. The course consists of a flat stretch followed by an uphill, then a downhill and finally another flat road. Juan goes faster than Pilar on the flat but Pilar goes uphill quicker than Juan. Downhill they go at approximately the same speed as each other. The result of the race is that they cross the finishing line at exactly the same time.

Which one of the following graphs best represents Juan's lead over Pilar from the start of the race to the finish?



- 18 I have a 24-hour digital clock beside my bed which shows times from 00:00 to 23:59. When I woke up during the night, I noticed, to my surprise, that the product of the two hours digits was the same as the product of the two minutes digits. None of them was a zero.

Not counting times which include a zero, or where the hours and minutes use exactly the same digits (e.g. 12:21), how many times does this happen during a 24-hour period?

- A** 6  
**B** 7  
**C** 9  
**D** 10

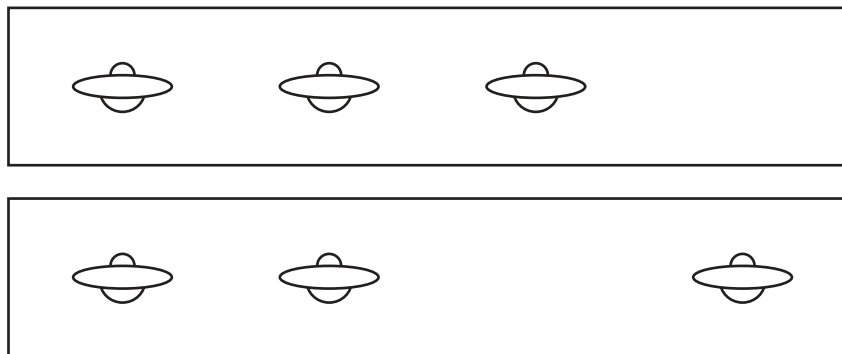
- 19 Giles works at his local shop in his spare time. He always works for a whole number of hours, but receives a different rate of pay for working at weekends than in the week (both pay rates are a whole number of dollars per hour). Giles has worked for the same number of hours in each of the last two weeks, but his pay was \$67 in the first week and \$79 in the second week.

Which of the following could **not** explain Giles's pay in the last two weeks?

- A Giles worked for 3 extra hours at the weekend in the second week.
  - B Giles is paid \$4 per hour more for working at the weekend.
  - C Giles worked for 5 extra hours at the weekend in the second week.
  - D Giles is paid \$6 per hour more for working at the weekend.
- 20 Colin said to Bill that the sum of the digits in his 3-figure house number was 12, and each digit was bigger than the one to the left of it. Bill said that was not enough information for him to work out the number.

Which one of the following additional pieces of information, on its own, would enable Bill to work out Colin's house number?

- A One digit is equal to the difference of the other two.
  - B Colin's house number is even.
  - C Two of the digits multiply to 12.
  - D The product of the digits is not a multiple of 6.
- 21 A fleet of UFOs was observed, and pictures taken of them at the same time from different places: one looking from the north and the other looking from the west.

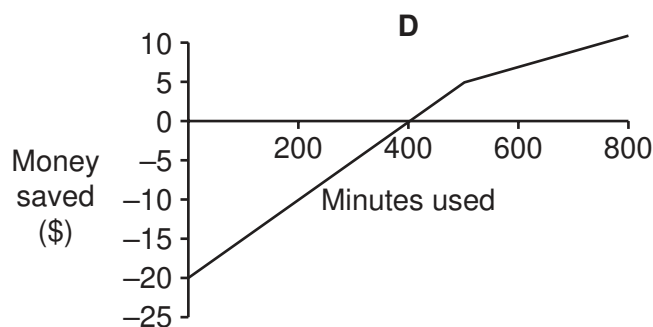
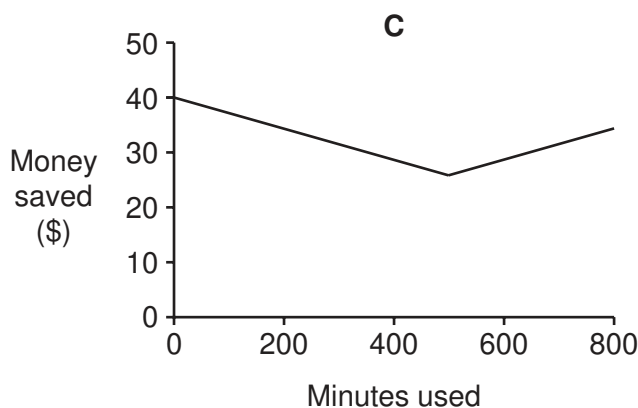
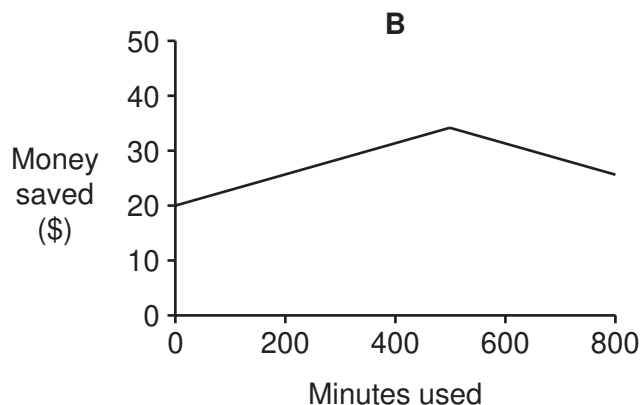
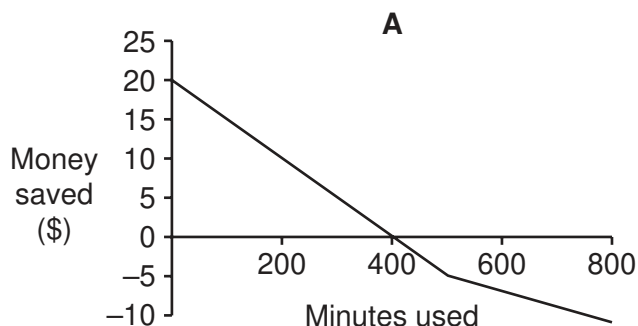


What is the largest number of UFOs that could be in the fleet?

- A 3
- B 5
- C 6
- D 9

- 22 My old mobile phone plan cost me \$20 per month, plus 3¢ for each minute. I have just changed to a new plan which has no monthly charge, but costs 8¢ per minute for the first 500 minutes and then 5¢ per minute for all minutes after that.

Which of the following graphs shows the money that I save each month by changing to the new plan?



- 23 John travels to school every day by bus and train. As a senior student, his day can start at different times. He has to walk for 5 minutes to the bus stop, and the bus runs every 15 minutes starting on the hour. The bus journey lasts 15 minutes, and then he has to wait either 5 or 20 minutes for his train. The train journey takes 20 minutes.

Which of the following could explain the time he has to wait for his train?

- A** The trains run every 15 minutes starting at 07:05.
- B** The trains run every 20 minutes starting at 07:00.
- C** The trains run every 25 minutes starting at 07:00.
- D** The trains run every 30 minutes starting at 07:05.

**24** My two daughters have plans to attend separate parties on Friday night.

Alice wants to go to the party at Charlie's house. It starts at 7 pm and finishes at 10:30 pm.

Elizabeth wants to attend Rhiannon's party at a club which is 15 minutes away from our home. It finishes at 10:40 pm.

They want me to drive them so that they arrive at the precise start times, and collect them at the precise end times.

I want us all to be home no later than 11 pm.

Which extra piece of information on its own would mean that not all of the above requirements can be satisfied?

- A** Charlie's house is 20 minutes from ours.
- B** Rhiannon's party starts at 7:15 pm.
- C** The club is 15 minutes away from Charlie's house.
- D** I do not get home from work until 6:30 pm.

**25** A football league is comprised of 22 teams. Over the course of a season, each team plays each of the other teams twice (home and away). For every game that is played, 3 points are awarded to the winning side, 0 points to the losing side, and 1 point to each side if the match is drawn (equal score). There are no other possible outcomes to a game. Each team's total points from all their matches played are added together at the end of the season and the three clubs with the fewest points are relegated to a lower league. If two or more clubs finish with the same number of points, their positions are decided by goal difference, i.e. the difference between the total number of goals they have scored and the total number scored against them over the course of the season. A side with a higher goal difference finishes above one with a lower one.

What is the lowest number of points that a club can get in one season and not necessarily be relegated?

- A** 4
- B** 5
- C** 6
- D** 9

- 26 Tony makes ornaments which he sells in boxes that are cuboid in shape. The dimensions are either  $5\text{ cm} \times 5\text{ cm} \times 12\text{ cm}$  or  $5\text{ cm} \times 6\text{ cm} \times 10\text{ cm}$ . He needs to package them in larger boxes to send out to the shops that sell the ornaments for him and he wants to buy just one size of box. The box needs to hold exactly 6 ornaments of the same type (regardless of which type it is).

The price of a box in cents is calculated by multiplying together the shortest two dimensions and then adding on the third. For example, a  $2\text{ cm} \times 3\text{ cm} \times 4\text{ cm}$  box would cost  $2 \times 3 + 4 = 10\text{ ¢}$ . Tony wants to get the cheapest box possible.

What will be the price of one box?

- A \$0.86  
B \$0.90  
C \$0.97  
D \$1.35
- 27 When Mary won \$3360 on a TV quiz programme she decided to give it to her two grandchildren, Susan and Luke, to be shared between them in the ratio of their ages.

5-year-old Luke complained that it wasn't fair that his older sister should get more than him. His mother sympathised, but told him to be thankful that his grandmother hadn't won the money next month (after Susan's birthday) when he would have received \$70 less, or last month (before his birthday) when he would have received \$160 less.

How much of Mary's \$3360 did Luke receive?

- A \$ 1050  
B \$ 1120  
C \$ 1200  
D \$ 1400
- 28 The hotel reception is staffed for 24 hours a day, 7 days a week, by one of the four receptionists. Whenever a receptionist comes to work he will work for 8 hours before the next receptionist takes over. The manager has a chart in her office which shows the availabilities for the receptionists, upon which they mark with a cross each shift for which they are unavailable. Wherever the manager has a choice of receptionist, she will assign the one whose previous shift was the longest time ago.

Karl is one of the receptionists and he worked on the first shift of the week both last Monday and this Monday. Karl was available for every shift last week, and all of the receptionists were available for the first shift this Monday.

What is the smallest number of crosses that there could be on the manager's chart for last week?

- A 0  
B 1  
C 2  
D 3

- 29 In the early stages of the Fantasy-World Cup the 24 competing teams are divided into four Groups of six. In each Group all teams play each other once, and the Group Winner progresses to the semi-finals. Teams gain 3 points for a win, 2 points for a score draw (1 – 1, 2 – 2 etc.) and 1 point for a scoreless draw (0 – 0).

This is the final table for Group 3:

	<i>Played</i>	<i>Won</i>	<i>Drawn</i>	<i>Lost</i>	<i>Goals For</i>	<i>Goals Against</i>	<i>Points</i>
Narnia	5	3	2	0	10	2	12
Omnia	5	3	1	1	8	2	11
Xanadu	5	2	1	2	8	6	8
Utopia	5	2	1	2	5	6	7
Lilliput	5	1	1	3	2	9	5
Ruritania	5	0	2	3	2	10	4

Narnia were losing 2 – 0 during their last match, but two late goals from Tumnus, Narnia's striker, ensured qualification for the semi-finals.

Against which team did Narnia draw 2 – 2 in their last group match?

- A Lilliput
  - B Omnia
  - C Ruritania
  - D Xanadu
- 30 A computer's filing system uses a label with each file to determine who is allowed to use that file, and in what way. A label consists of nine characters: the first three for the user; the next three for the user's group; the last three for everyone. Each set of three covers the three functions 'read', 'write', and 'execute'.

For example,  $r\ w\ x\ r\ w\ -\ r\ -\ -$  would permit the user to read, write or execute; any member of the group could read or write; and others could only read the file.

It is not valid to allow the group to do something but forbid the user. It is also not valid to allow everyone and forbid the group. All other combinations are valid, although these include some options which are unlikely to be useful.

How many valid labels are possible?

- A 64
- B 81
- C 512
- D 777

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