



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

THINKING SKILLS

9694/12

Paper 1 Problem Solving

October/November 2012

1 hour 30 minutes

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



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.

This document consists of **19** printed pages and **1** blank page.



- 1 In the International Sports Championships, the ticket prices for each event have been determined and prices issued. The following is the table of costs for tickets to the Tiddlywinks Competition which runs from the 22nd to the 25th July.

	<i>All Day</i>	<i>Morning</i>	<i>Afternoon</i>	<i>Evening</i>
<i>Luxury Box</i>	\$50	\$20	\$20	\$20
<i>Grandstand</i>	\$40	\$16	\$16	\$16
<i>Main Stand</i>	\$30	\$13	\$13	\$13
<i>North Terrace</i>	\$20	\$10	\$10	\$10
<i>Paddock</i>	\$10	\$5	\$5	\$5

Children are charged half price.

Family tickets for 2 adults and 2 children are charged at twice the cost of a single adult ticket.

Up to a month before the event, seats can be booked in advance for a 10% discount which applies to all tickets. After this discount is applied, a fixed commission charge of \$2 per order is added.

I want to buy tickets for 2 adults and 3 children for the North Terrace on the afternoon of the 22nd. It is now two months before the event. I want to get the cheapest price available.

How much will my tickets cost?

- A \$20.00
 - B \$22.50
 - C \$24.50
 - D \$27.00
- 2 A child leaves home at 8 am and walks to school. When she arrives at school, 15 minutes is spent having breakfast and then she has 20 minutes to catch up with friends before lesson 1 begins. There are 6 lessons a day of 50 minutes duration and a break after every 2 lessons. Morning break after lesson 2 is 15 minutes, and lunch break after lesson 4 is 1 hour long. At the end of the day it takes 25 minutes to walk home, which is 5 minutes longer than walking to school.

What time does lesson 5 start?

- A 13:30
- B 13:35
- C 14:20
- D 15:10

- 3 David and his grandfather Edward went out along a path, with David on his bike and Edward walking. David went all the way to the end, a distance of 6 km, then turned around and came back. Edward walked at half David's cycling speed. When David met Edward as he was coming back, Edward turned around and they continued home together at Edward's speed.

How far did Edward walk?

- A 4 km
 - B 6 km
 - C 8 km
 - D 9 km
- 4 At a recent televised snooker match between James Hoopoo and Ron Knight, a viewer phone-in was held to vote on which player was the better tactician. Ron scored only 24%.

If this figure has been given to the nearest 1%, what is the smallest number of votes that could have been cast?

- A 4
 - B 17
 - C 25
 - D 33
- 5 In each of the last five rugby matches between Harlacens and Sarequins, Harlacens have scored a different multiple of 7 points between 14 and 42 inclusive, whilst Sarequins have scored a different multiple of 5 points between 15 and 35 inclusive.

David worked out that the scorelines (Harlacens first) were 14 – 15, 21 – 25, 28 – 20, 35 – 30 and 42 – 35.

Which of the following additional pieces of information was sufficient by itself for him to work out the scorelines?

- A The largest total number of points scored in one match was 77.
- B The largest winning margin was 8 points.
- C The smallest total number of points scored in one match was 29.
- D The smallest winning margin was 1 point.

- 6 I am buying cards to give to my friends for Christmas. I am going to buy as many cards as I can.

I want to make sure that I have a mixture of designs with no more than 4 cards of any one design. In each pack of cards there is the same number of cards for each design. None of the designs occurs in more than one type of pack, and all packs of a given type are identical.

The different packs that are available are summarised below.

<i>Number of designs</i>	<i>Number of cards in pack</i>	<i>Price</i>
2	8	\$0.40
2	16	\$0.80
4	20	\$1.40
4	40	\$1.60
5	20	\$1.00

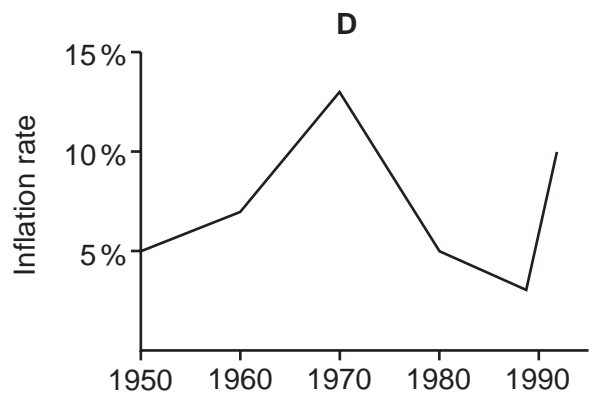
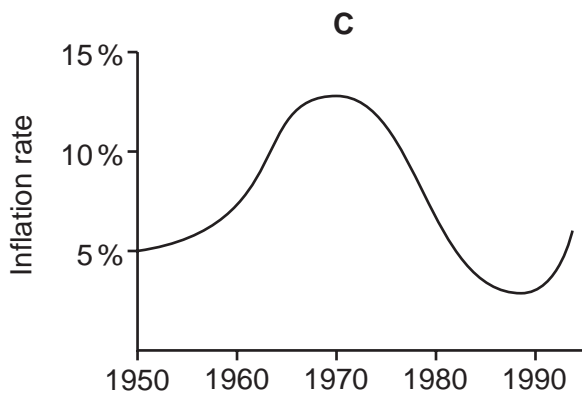
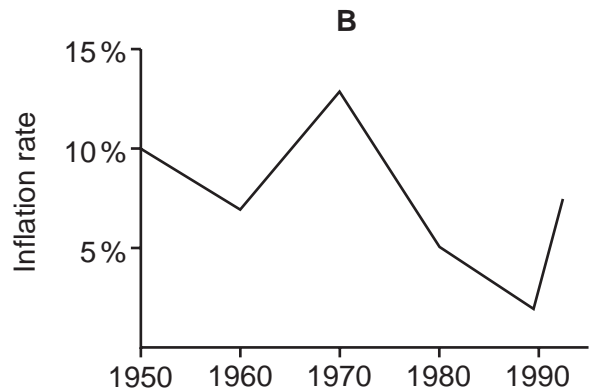
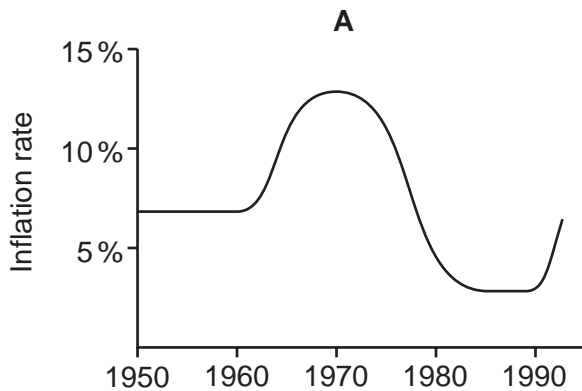
<i>Number of designs</i>	<i>Number of cards in pack</i>	<i>Price</i>
2	10	\$0.50
4	12	\$0.80
4	32	\$2.00
5	10	\$1.30
8	40	\$2.40

What is the average price per card of the cards that I will buy?

- A 4¢
- B 5¢
- C 7¢
- D 8¢

- 7 In Westland, during the 1950s, prices rose steadily at about 7% per annum. During the 1960s, higher wage demands caused prices to increase more and more rapidly throughout the decade. The Government decided to make control of inflation its prime objective and gradually the rate at which prices rose, year on year, began to fall. This continued throughout the 1970s until by the end of the decade prices were only rising at about 5% per annum. The first half of the 1980s saw price rises slow further, and by 1985 inflation had dropped to 3%. This was maintained until 1989 when a series of major bank failures caused high inflation over the following 3 years, as the currency fell sharply in value.

Which of the following graphs best represents the Westland inflation rate?



- 8 A printer has run out of ink and needs to purchase supplies to ensure that he can carry on his part-time business. The maximum he prints is 3500 sheets per day, whilst the minimum is 1000 sheets per day. He works at least three days per week, but at busy times he can work up to six days per week. The ink containers will provide for 600 sheets of heavily-detailed material or 1000 sheets of lightly-detailed material.

How many containers of ink will he need to purchase to ensure that he will not run out of ink in the next 4 weeks?

- A 20
- B 24
- C 84
- D 140

- 9 When I glanced at my car mileage it showed 24 942, a palindromic number (one which reads the same forwards as backwards). A few days later, I noticed that it showed 26 062, another palindromic number.

How many other palindromic numbers had I missed between the two?

- A 1
- B 9
- C 10
- D 100

- 10 In Bolandia, customers pay monthly for the use of electricity.

The electricity company can either have a constant **unit rate** for all levels of consumption, or it can charge one rate up to a certain level of consumption, and a lower rate above that level.

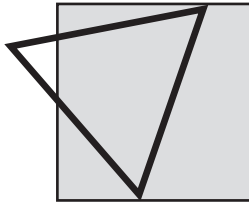
The company can choose whether or not to have a monthly **fixed charge** in addition to the unit rate.

Electricity tariffs have not changed for some time. David paid \$132.50 in January, when he used 1200 units; in March his bill for 800 units was \$92.50, and in July he paid \$50.00 and used 400 units.

Which one of the following tariff structures could explain these bills?

- | | <i>Fixed charge?</i> | <i>Lower unit rate?</i> |
|---|----------------------|-------------------------|
| A | No | After 500 units |
| B | No | After 1000 units |
| C | Yes | No |
| D | Yes | After 300 units |

- 11 A chef is going to use a triangular cutter to cut shapes from square pieces of pastry. The cutter and the pastry have the same side length. One possible shape is shown below.



What is the maximum number of sides that a cut piece of pastry inside the triangle can have?

- A 4
B 5
C 6
D 7
- 12 At 15:00 Andy leaves Alphaville. He drives due West at a constant speed of 60 km/h.
- At 15:00 Brian is 90 km due South of Alphaville and drives at a constant speed of 30 km/h towards the town.

At what time will Andy and Brian be exactly the same distance from Alphaville?

- A 15:45
B 16:00
C 16:30
D 18:00

- 13 A teacher's contract requires her to spend 800 hours in contact with students during the school year. The school year lasts 40 weeks and each period lasts 1 hour.

This is her timetable for the new academic year.

<i>Day</i>	<i>Period 1</i>	<i>Period 2</i>	<i>Period 3</i>	<i>Period 4</i>	<i>Period 5</i>	<i>Period 6</i>
Monday	3B	2J	1H	-	2H	1A
Tuesday	-	3B	-	4G	3T	5L
Wednesday	1A	-	6L	2P	-	2T
Thursday	2J	-	5L	2T	4G	-
Friday	1H	-	2P	3T	-	6L

Within the 40 weeks of the school year, students get a week's study leave in January and three weeks in June. However, the teacher is expected to do 9 hours of invigilation during each week of study leave, which also counts as contact hours.

The teacher checks whether the school is giving her too much contact time.

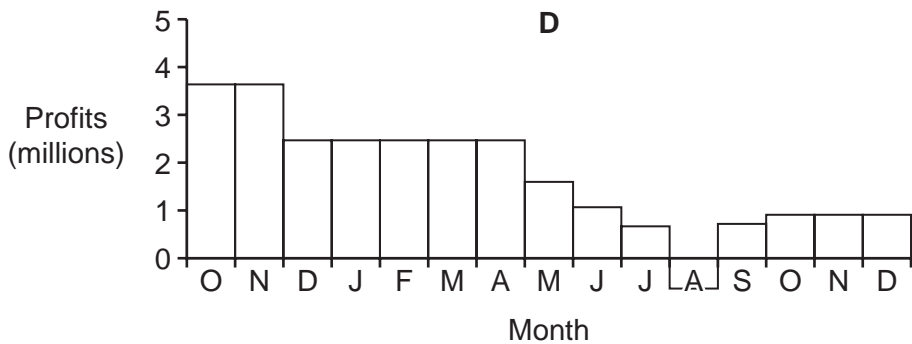
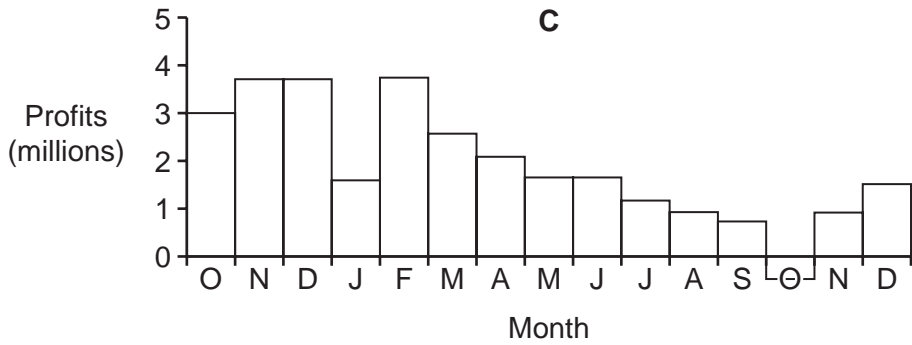
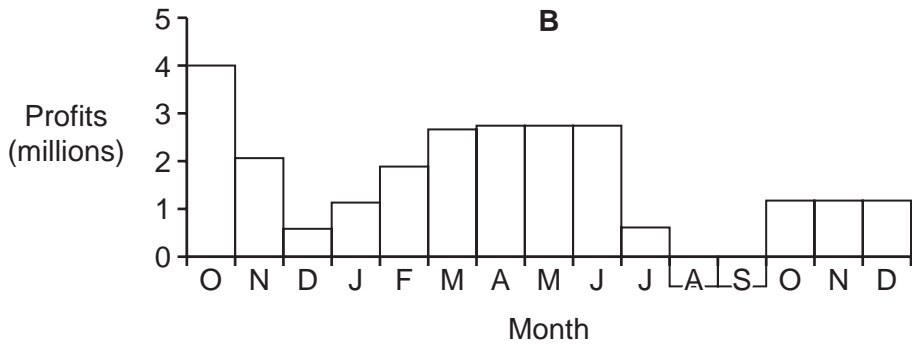
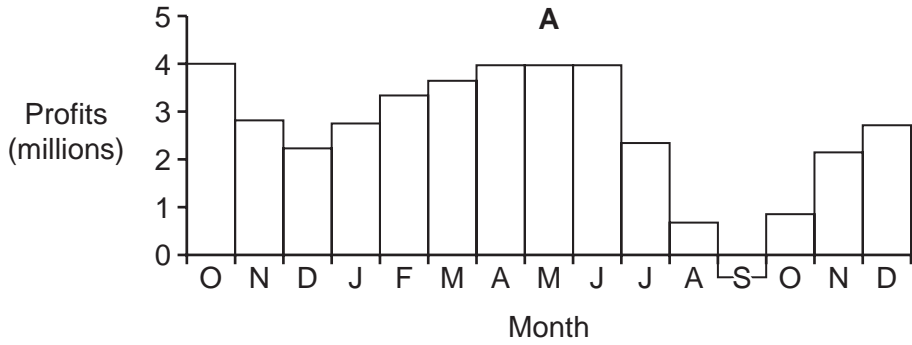
How many hours over or under her contracted time is she due to work?

- A 4 hours over
- B 8 hours over
- C 8 hours under
- D 17 hours under

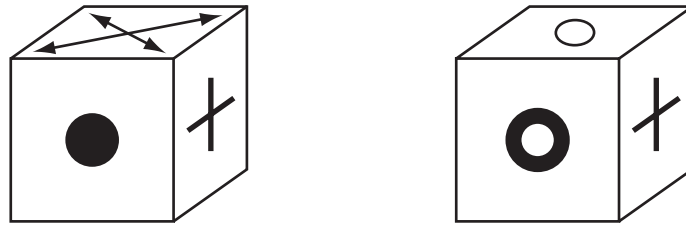
14 The statement given by a bank about its profits during 2010 is given below.

“Declining profits in the final three months of 2009 became rising profits in the first three months of 2010. The next three months saw profits remain stable, whilst the three months after that saw a decline and losses in one month. However, the final three months saw a return to growth.”

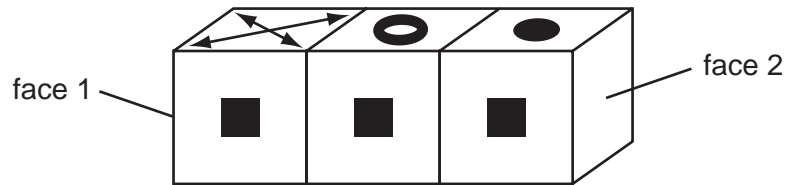
Which one of the four graphs shown below most accurately represents this?



15



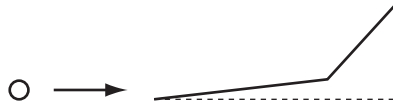
Above is a picture of two identical boxes. Below is a picture of three of these boxes placed in a line.



What are the shapes on the end faces, face 1 and face 2?

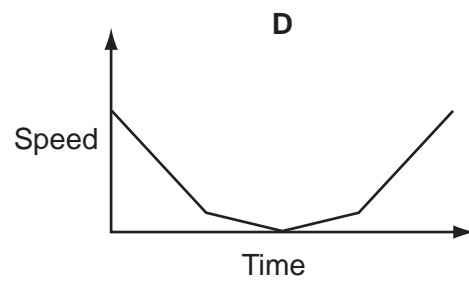
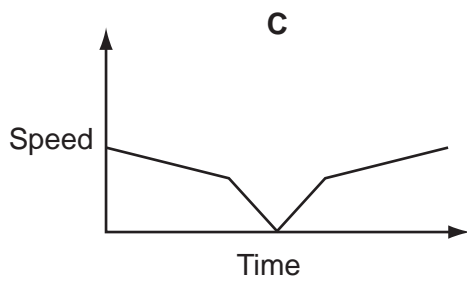
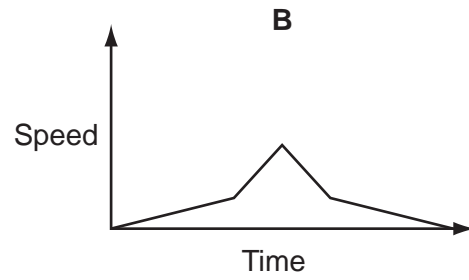
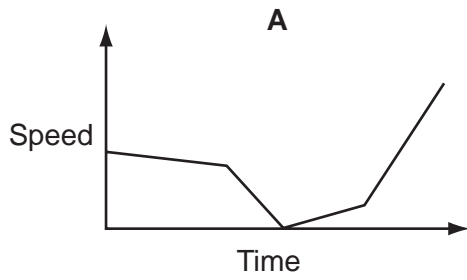
- A** One is ● and the other is ✕
- B** One is ● and the other is ○
- C** One is ◉ and the other is ✕
- D** One is ◉ and the other is ○

16 A ball is rolled towards a ramp that is shaped as shown below:



The speed is observed as the ball rolls up and down the ramp.

Which one of the following could show the graph of speed against time?



- 17 George's consultancy firm has a large number of employees who use their own cars when travelling to customers. The company pays 10¢ per kilometre travelled towards the cost of the journey, plus an additional 25¢ for each visit made. Because many employees have complained that this is not enough to cover the cost, George has decided to change the policy.

He can only afford to increase the total cost for an average week (40 visits covering a total of 300 kilometres) by 10%. The new policy will still offer a rate per kilometre, plus an amount per visit (both of which will be a whole number of cents), and George wants the rate per kilometre to be as high as possible.

What will be the amount paid for a visit involving travel of 20 kilometres?

- A \$2.80
 - B \$2.85
 - C \$3.00
 - D \$3.05
- 18 Petra receives three job offers. She will only work 35 hours a week (excluding breaks) and for no more than 9 hours a day (including breaks). She will only work five days each week, but she wants to earn the highest salary possible.

Her current post at Ripemoff Limited fits her time conditions perfectly and she earns \$10 per hour with a fixed bonus of \$25 per week.

She is offered a post at Hardwork Products. She would have to work four half days (08:00 to 14:00) and one full day (08:00 to 17:30 with a lunch break of 1 hour), and would be paid \$70 for each of her four half days and \$140 for her full day.

Another post is at Slavedrivers Incorporated. She would have to work 09:00 to 16:00 for three days and 09:00 to 18:00 for the other two, with half an hour lunch break every day. She would be paid \$11 per hour.

The third post is at Poundflesh Partners. She would have to work 08:30 to 16:30 (with two breaks of half an hour each) five days each week, and would be paid \$9 per hour and a fixed bonus of \$14 per day.

None of the companies pays its employees for their breaks.

Which option should Petra choose?

- A Stay at Ripemoff Limited
- B Move to Hardwork Products
- C Move to Slavedrivers Incorporated
- D Move to Poundflesh Partners

- 19 A young student, living in Wareham, wishes to spend a holiday week in Kendal. She has a budget of \$50 to travel for the return journey. She will be travelling on Thursday and returning the following Thursday. She does not wish to have more than 2 changes on either journey and she must reach the hotel by 20:00. On the return journey she wants to get home by 22:30.

A timetable of train times, and the journey prices, is shown below.

	<i>Mon–Thurs only</i>	<i>All Days</i>			
<i>Depart Wareham</i>	06:03	07:03	08:03	09:03	13:03
<i>Changes</i>	3	2	2	2	3
<i>Arrive Kendal</i>	17:58	19:06	21:05	22:10	23:00
<i>Price (\$)</i>	20	24	27	30	24

	<i>Mon–Thurs only</i>	<i>All Days</i>			
<i>Depart Kendal</i>	07:45	08:45	09:45	11:05	12:05
<i>Changes</i>	3	2	2	2	3
<i>Arrive Wareham</i>	17:06	18:20	20:00	22:06	23:00
<i>Price (\$)</i>	20	24	27	30	24

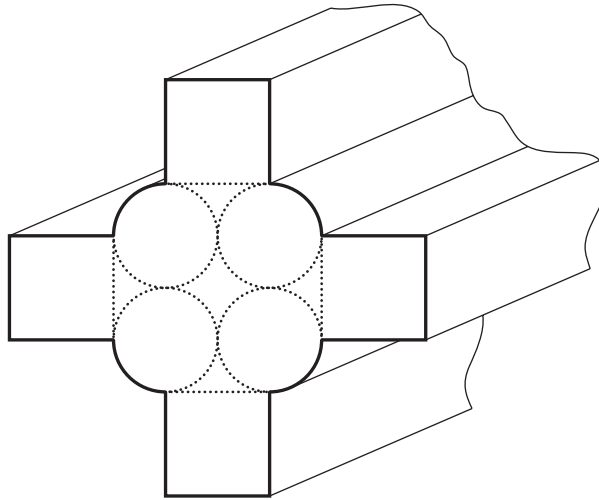
Which of the following represents the best outward and return journeys for the student to take?

- A Depart Wareham 06:03, depart Kendal 09:45
 B Depart Wareham 07:03, depart Kendal 08:45
 C Depart Wareham 08:03, depart Kendal 07:45
 D Depart Wareham 09:03, depart Kendal 07:45
- 20 Ben hires a motor van to help his friend move house. He knows that the round trip is 350 km and the van hire company tells him that the van does 100 km per \$10.00 worth of diesel fuel (the diesel costs 70 cents per litre). He asks them to put \$36.00 worth of diesel into the van. However, the pump is faulty and actually puts in extra fuel at a rate of 51 litres for every 50 litres shown on the pump. On the return journey he encounters a fallen tree across the road and has to make a detour. There are no filling stations on the remainder of his journey, but he decides to get as near to his destination as he can.

What is the maximum distance the detour could have added to his journey if he still manages to make it back?

- A 2.8 km
 B 7.2 km
 C 10.0 km
 D 17.2 km

- 21 The hollow tube below is to be painted on the outside surface along its length. The perimeter of each circle is 471 mm and the perimeter of each square is 600 mm. The length of the whole tubular section to be painted is 5 metres.



What approximately is the outside surface area of the tube (**not** including the ends)?

- A 2.27 m²
 B 11.4 m²
 C 12.0 m²
 D 21.4 m²
- 22 I overheard part of a conversation today in which one person said, “In my 4-digit PIN the first two digits are my house number, the middle two digits are a prime number, and the last two digits are a square number.”

“That’s careless talk,” I thought. “Now we all know the last digit of your Personal Identification Number.”

What is the last digit of this person’s PIN?

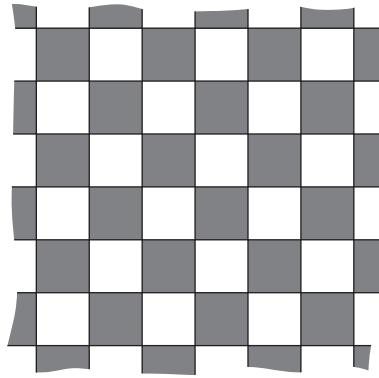
- A 4
 B 5
 C 6
 D 9

- 23 I am in my car on a highway travelling at 120 km/h and have just come up behind a truck travelling at 100 km/h. I need to get off at the next junction, for which there is a sign saying it is 2 km away. I am 25 m behind the truck which is 25 m long. I will need a gap of 50 m between me and the truck if I am to pull in safely in order to leave the highway.

How far will I be from the junction when I am 50 m in front of the truck?

- A 0.6 km
- B 1.4 km
- C 1.5 km
- D 1.9 km

24 I recently laid a carpet with the following pattern.



Due to the awkward shape of the room, I had to cut four pieces out to make it fit.

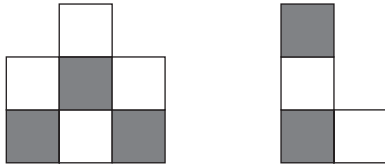
I was able to stitch the four pieces together to make a rectangular mat with exactly the same pattern as the whole carpet.

These were two of the pieces.

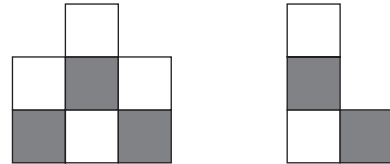


Which one of the following pairs could have been the other two pieces?

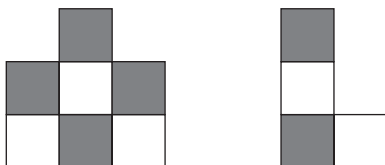
A



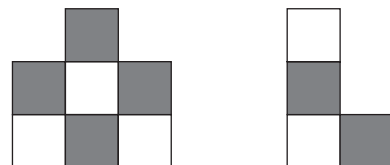
B



C



D



- 25** Fred has a four-digit Personal Identification Number (PIN) for his card to draw money out of his bank account. All possible 10 000 numbers are allowed. His bank has an unusual security system: it requires customers to get exactly one digit wrong each time, and not to use the same four-digit code as was used the previous time. Someone steals his card, but has no information about Fred's PIN.

How many numbers that the thief could try would be accepted as valid?

- A** 3
 - B** 4
 - C** 35
 - D** 36
- 26** There are 10 teams in a college football league. In the first part of the season each of the teams plays each other once. On the basis of the results of these matches, the teams are then separated into a high and low division of five teams each. In the second part of the season each team plays every team in its division twice.

How many matches in total are played in the first part of the season compared to the second part?

- A** There are the same number of matches in both parts of the season.
 - B** There are twice as many matches in the second part of the season compared to the first.
 - C** There are 5 fewer matches in the first part of the season than in the second.
 - D** There are 5 more matches in the first part of the season than in the second.
- 27** I am preparing some prizes for a game at my son's birthday party this weekend. I want to choose five different prizes out of the eight that I think are suitable. The prices of the individual prizes are \$3, \$3.30, \$3.60, \$4, \$4.50, \$5, \$5 and \$8. I will pay as much as possible up to a maximum of \$20.

What is the total that I will spend on the prizes?

- A** \$19.60
- B** \$19.80
- C** \$19.90
- D** \$20.00

- 28 At the local tennis club, there are monthly mini-leagues made up of players of roughly equal abilities, and, if they have the time and can organise the match, each player plays everyone else in the league once. The winner of each league gets a small prize. Matches in the league are determined over the best of three sets, so a match is won by either two sets to zero, or two sets to one. The table below shows the points awarded to players in division 5 for the May league.

	<i>v. Anita</i>	<i>v. Diane</i>	<i>v. Jeyna</i>	<i>v. Lizzie</i>	<i>Total points</i>
<i>Anita</i>	 	5	5	0	10
<i>Diane</i>	3	 	3	5	11
<i>Jeyna</i>	2	5	 	5	12
<i>Lizzie</i>	0	2	3	 	5

Which of the following set of rules for awarding points could explain the points in this table?

- A** Three points for a win, and one point for each set won.
- B** Two points for a win, one point for each set won, and one point for playing the match.
- C** One point for a win, one point for each set won, and two points for playing the match.
- D** Two points for each set won and one point for playing the match.
- 29 My daughter claims to be the number one fan of the band Kites. She has all their CDs and a roomful of other merchandise. She also asks me to save any articles I find about them in my newspaper.

There is an article in today's paper which lists the band members as Keith (22), Ivan (20), Tom (21), Eddy (21) and Scott (22). In the last article I came across they were described as Keith (21), Ivan (20), Tom (21), Eddy (20) and Scott (22).

I know that their birthdays are as follows.

Keith – 15th April
 Ivan – 21st May
 Tom – 17th October
 Eddy – 5th May
 Scott – 3rd April

What is the maximum time difference between the publication of the two articles?

- A** 21 days
- B** 32 days
- C** 36 days
- D** 47 days

30 As part of a job interview, Iris has been given a memory test.

She was given one minute to study a picture of a clock whose numbers 1 to 12 were a variety of colours.

At the end of the minute she was confident of the following:

- Four of the numbers were green, three were blue, three were yellow and two were red.
- The three blue numbers were 2, 7 and 12.
- Except for the two red numbers, no two neighbouring numbers were the same colour.
- No pairs of opposite numbers (12 and 6, 1 and 7 etc.) had repeated colour combinations (so, for instance, two of the green numbers must have been opposite each other, since green cannot have been opposite blue, red or yellow twice).

Now Iris has been asked to name the colour of each of the twelve numbers on the clock face.

The information that Iris has memorised is sufficient for her to be certain of the colour of how many of the twelve numbers?

- A** Three
- B** Four
- C** Eight
- D** Twelve

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