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**THINKING SKILLS**

**9694/11**

Paper 1 Problem Solving

**October/November 2017**

**1 hour 45 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.**

DO **NOT** WRITE IN ANY BARCODES.

**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 **19** printed pages and **1** blank page.



- 1 A toll road has queues of traffic at each payment booth (and a bypass for motorcycles as they are free).

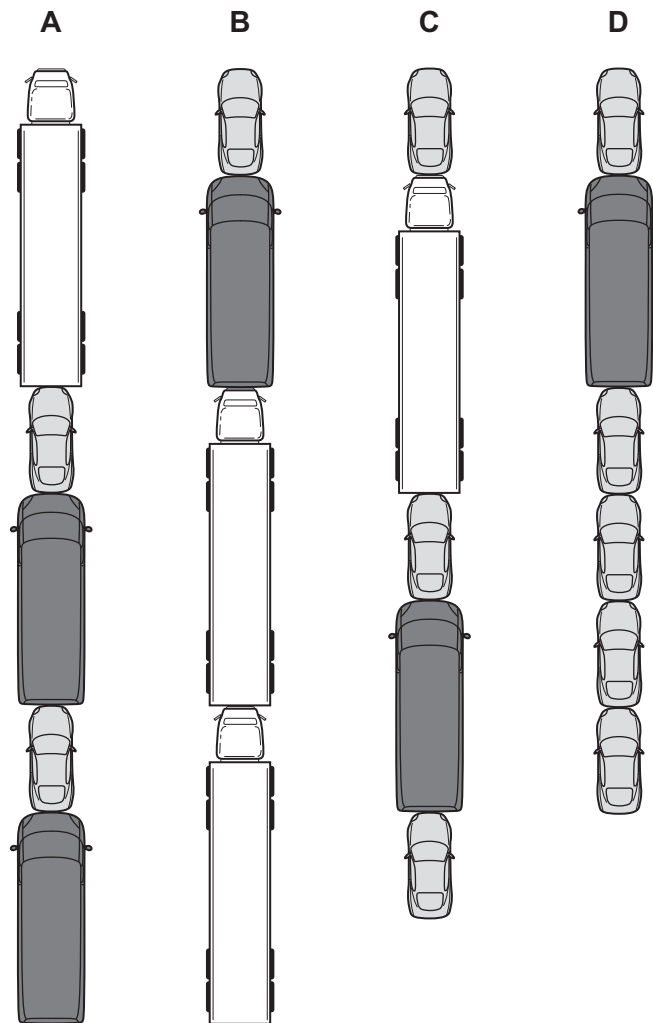
The prices are:

<i>Vehicle</i>	<i>Price</i>
Car	\$6.90
Van	\$6.30
Truck	\$14.10

The time taken for each vehicle is almost entirely taken by handing over cash, waiting for the receipt and any change, and then for the attendant to raise the barrier.

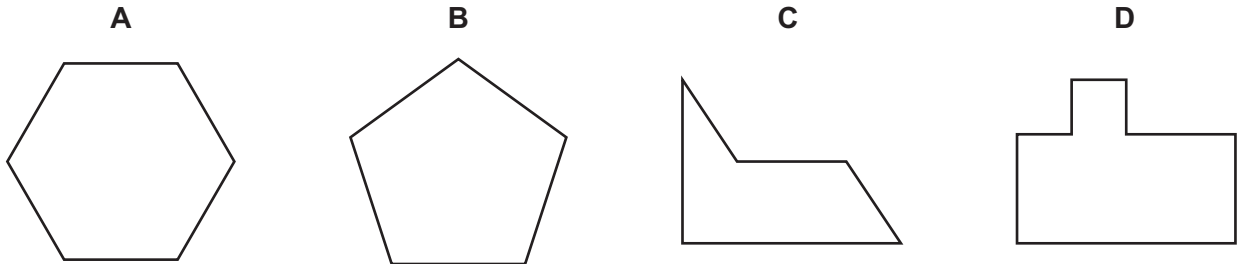
Trucks are three times the length of cars, and vans are twice the length of cars.

Which queue should I join when coming up to the queues below?



- 2 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 tile is **not** suitable for the job?



- 3 Three friends, Janet, Kirsty and Linda, all gave birth on the same day.

Janet's son was the first to arrive, at 11:11, followed by Kirsty's daughter 111 minutes later. Finally, Linda had her daughter 111 minutes before midnight.

What was the time interval between the births of the two girls?

- A 8 hours 49 minutes  
 B 9 hours 07 minutes  
 C 10 hours 27 minutes  
 D 10 hours 58 minutes
- 4 The new Catering Manager at a football club wants to work out the number of pies sold at the stadium during the course of one season. He knows that the number of pies sold at each match is always the same. He also knows some precise data:
- during play each of the kiosks sells 15 pies;
  - during half-time, pies are bought at the rate of 10 per minute;
  - in the first 9 home matches of the season 4068 pies were sold.

What other piece of information would be sufficient to calculate the number of pies sold during the course of one season?

- A How long half-time lasts  
 B How many kiosks there are in the stadium  
 C How many home matches are played in one season  
 D How many people attend each match on average

- 5 Next Tuesday, Adam is going to travel by train from his home at Aston to his mother's house at Grove. He wants to stop for at least 20 minutes at Capel to do some shopping, and for at least 1 hour at Elton to visit his sister.

## KEY

F = fast train

S = Sunday service only

– = train does not stop at this station

	ASTON	BEAL	CAPEL		DEAN	ELTON		FILEY	GROVE	
			Arrive	Depart		Arrive	Depart			
	11:07	11:09	11:16	11:18	11:27	11:35	11:37	11:54	12:14	
	11:37	11:39	11:46	11:48	11:57	12:05	12:07	12:24	12:44	
<b>F</b>	12:07	12:09	12:16	12:18	–	12:34	12:37	–	13:14	<b>F</b>
<b>S</b>	12:37	12:39	12:46	12:48	12:57	13:05	13:07	13:24	13:44	<b>S</b>
	13:07	13:09	–	–	13:27	13:35	13:37	13:54	14:14	
<b>S</b>	13:25	13:27	13:34	13:36	13:45	13:53	13:55	14:12	14:32	<b>S</b>
<b>F</b>	13:56	–	14:04	14:07	14:15	14:20	14:22	–	14:47	<b>F</b>
<b>S</b>	14:22	14:24	14:29	14:31	14:39	14:46	14:48	15:09	15:27	<b>S</b>
	14:55	14:57	15:04	15:06	15:15	15:21	15:23	15:42	16:02	
<b>F</b>	15:26	15:28	15:35	15:37	–	15:49	15:52	–	16:17	<b>F</b>
	16:07	16:09	16:17	16:19	15:27	16:35	16:37	16:54	17:14	
<b>S</b>	16:37	16:39	16:46	16:48	16:57	17:05	17:07	17:24	17:44	<b>S</b>

If Adam wants to arrive at Grove before 17:00, what is the latest train he can catch?

- A 11:37
- B 12:07
- C 13:25
- D 13:56

- 6 The farthing used to be the smallest coin. Items in the market could be priced at a fraction of a farthing, but the amount to pay would be a whole number of farthings. So, even if buying an item worth just  $\frac{1}{10}$  of a farthing, this would be rounded up to a whole farthing.

You could get just 2 sparrows for 1 farthing, but 5 sparrows for 2 farthings.

Which of the following represents the range within which the price for 1 sparrow must lie?

- A More than  $\frac{1}{3}$  but at most  $\frac{1}{2}$  of a farthing
- B More than  $\frac{1}{3}$  but at most  $\frac{2}{5}$  of a farthing
- C Exactly 1 farthing
- D More than  $\frac{2}{5}$  but at most  $\frac{1}{2}$  of a farthing
- 7 A number game is set up on 6 cylinders which have a common axle. Cylinder A does not move, but the others can move in either direction. The numbers are set out as in the table below.

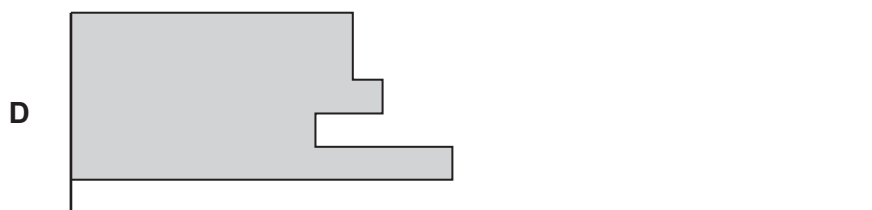
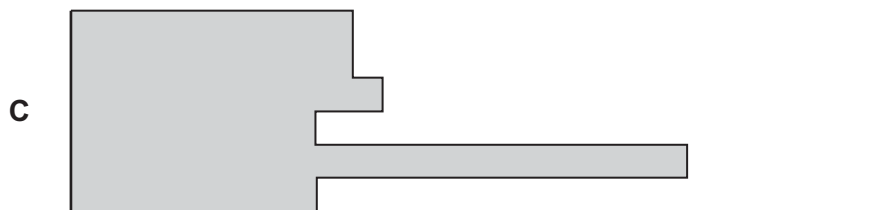
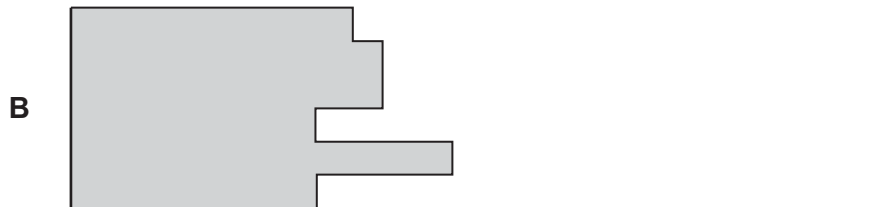
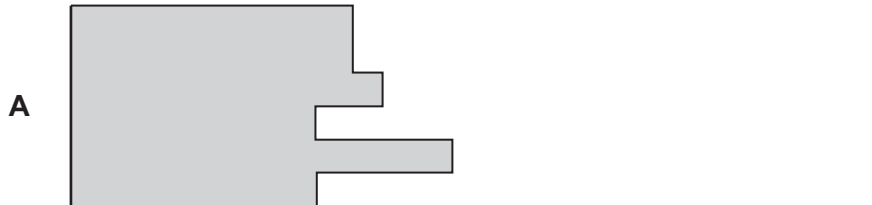
Row	Cylinder A	Cylinder B	Cylinder C	Cylinder D	Cylinder E	Cylinder F
1	1	1	1	1	1	1
2	5	6	6	4	2	5
3	2	2	2	5	3	2
4	6	3	4	2	4	4
5	4	4	3	6	5	6
6	3	5	5	3	6	3

If Row 1 is set to read 1, 2, 3, 4, 5, 6 across, what will Row 4 read at the same time?

- A 6 4 6 3 2 5
- B 6 5 5 3 2 5
- C 6 5 6 3 1 5
- D 6 5 6 6 2 5

- 8 A mechanic earns \$40 a day and is given a bonus on each day that he produces over 100 components. This bonus is paid at the rate of \$5 for every extra complete group of 10 components. He earned a \$10 bonus on Wednesday, and double this bonus on Friday. On Tuesday he produced 19 extra components but on Thursday only 8. Monday's bonus was \$5 for 17 extra components. At work on Saturday he felt tired and did not produce any extra components at all.

Which of these graphs, if suitably labelled, would represent his week's earnings?



- 9 Helen uses the internet to book a flight with Whooshairways.com. For her chosen destination the charges are as follows:

Flight	one way only	\$85
	both ways	\$150
Reserved seat	one way only	\$8
	both ways	\$14
Extra leg room	one way only	\$6
	both ways	\$10
In-flight meal	one way only	\$10
	both ways	\$18
Donation to charity	\$2 or \$5	
Internet booking fee	\$5	
5% added to the total for using a credit card		

Helen books a one-way flight, reserves her seat, has an in-flight meal, donates \$2 to charity and pays using a credit card.

What is the total amount she pays?

- A \$110.00  
 B \$110.25  
 C \$115.00  
 D \$115.50
- 10 Diane uses similar passwords for all four of her online accounts. All of her passwords consist of 7 characters. She knows that her password for her online bank account has exactly one character different from each of her other three passwords.

Her four passwords are given below.

97KAm3x

97KVm5x

97KVm3x

27KVm3x

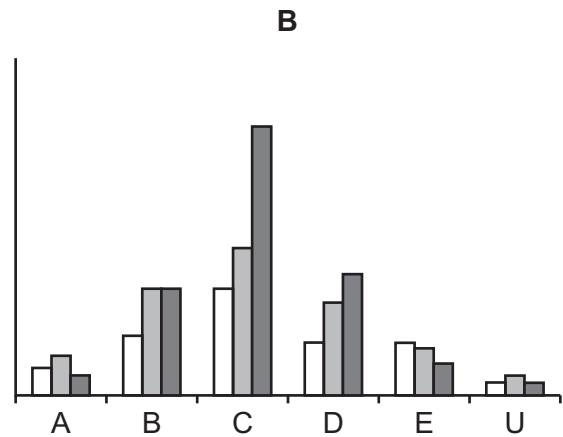
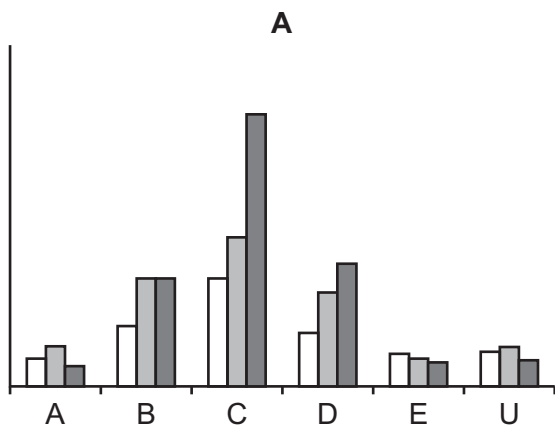
Which one is Diane's password for her online bank account?

- A 97KAm3x  
 B 97KVm5x  
 C 97KVm3x  
 D 27KVm3x

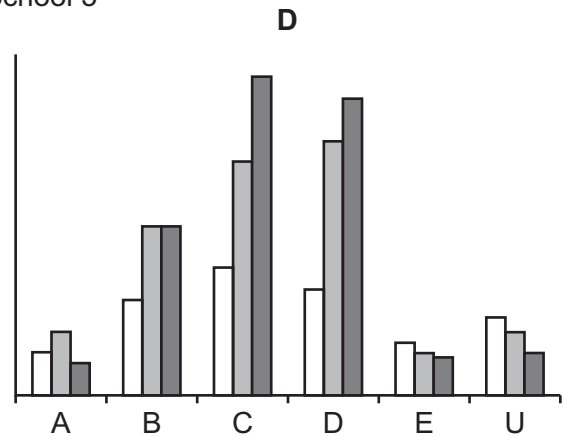
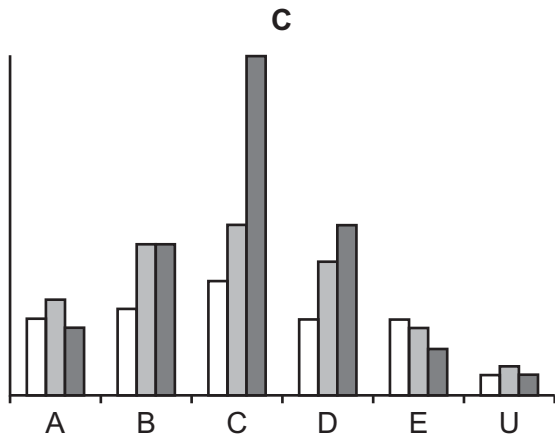
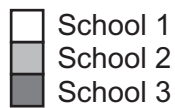
11 In an examination involving students from three schools, the following results were achieved:

	A	B	C	D	E	U
School 1	20	45	80	40	25	27
School 2	30	80	110	70	20	30
School 3	15	80	200	90	18	20
TOTAL	65	205	390	200	63	77

Which one of the following bar charts represents these results?



Key





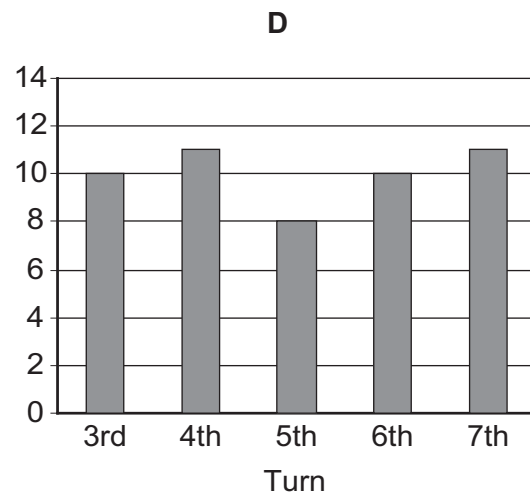
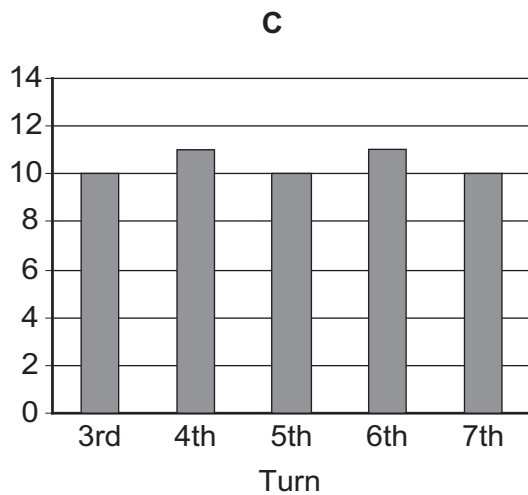
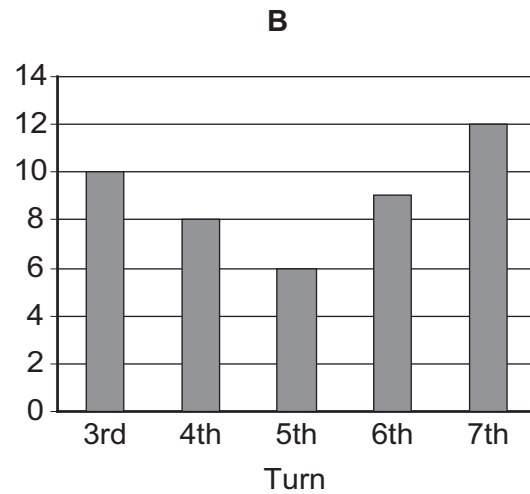
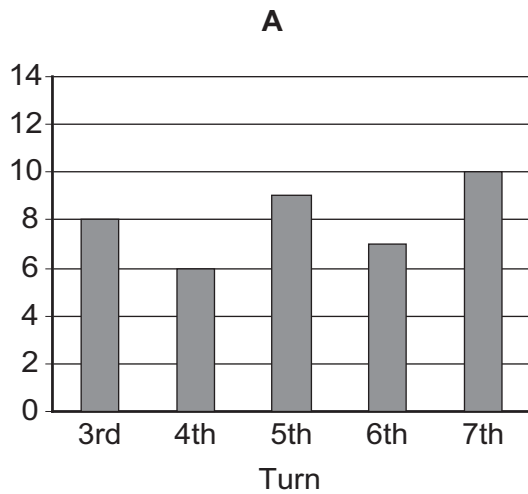
- 12 Tim and Tom have borrowed a jar of beans and a die from their mother and are playing a simple game. The rules of their game are as follows.

At the start of the game each player takes 10 beans from the jar. Then they take turns and, at his turn, each player throws the die.

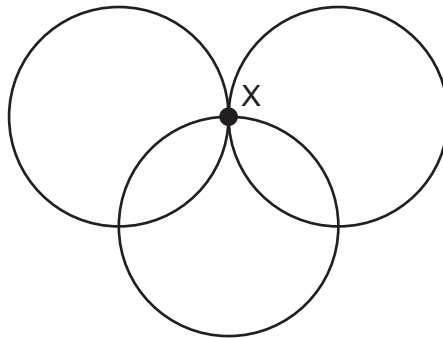
- If he throws a 2, he returns two beans to the jar.
- If he throws a 4 or a 6, he returns one bean to the jar.
- If he throws a 3, he takes three beans from the jar.
- If he throws a 1 or a 5, he takes one bean from the jar.

The first player to be left with no beans wins the game.

Which one of the following charts could **not** represent the number of beans held by Tim during part of the game?



- 13 Three cyclists cycle along identical circular tracks, which are exactly one third of a kilometre in circumference. The three tracks meet in the centre as shown below. Each cyclist rides around a different circle. One cyclist travels at 6 km/h, another at 9 km/h and the third at 12 km/h.



If they all start at X at the same time, how long will it be before they all next meet at X?

- A 1 minute 40 seconds  
 B 3 minutes 20 seconds  
 C 6 minutes 40 seconds  
 D 13 minutes 20 seconds
- 14 The local Jazz Club met 50 times last year. At each meeting there were 20 slots on the playlist, with one tune played in each slot.

A careful study of the playlists for last year showed that:

40% of the slots were used for tunes that were not played at any other time that year.

45% of the slots were used for tunes that were played just twice.

Half of the remaining slots were used for tunes that were played 3 times.

There were only 5 other tunes played during the year, and the number of times that these were played was in the ratio 5 : 4 : 3 : 2 : 1.

How many different tunes will a member who attended all meetings have heard during the year?

- A 655  
 B 705  
 C 880  
 D 930

- 15** The six digits of my employee reference code at work are all different. The first digit is 1 and the last one is 8.

When the code is written as three 2-digit numbers, the middle number is a square number and is exactly half way between the other two numbers.

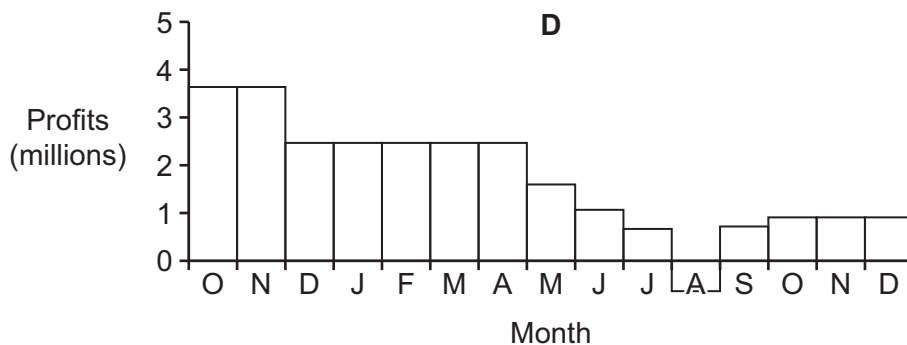
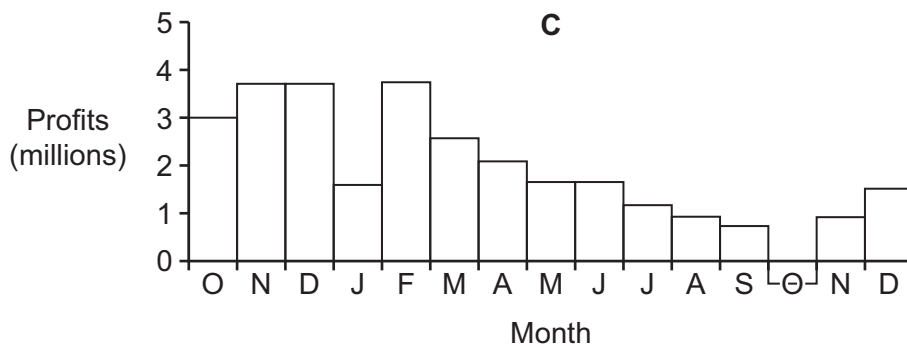
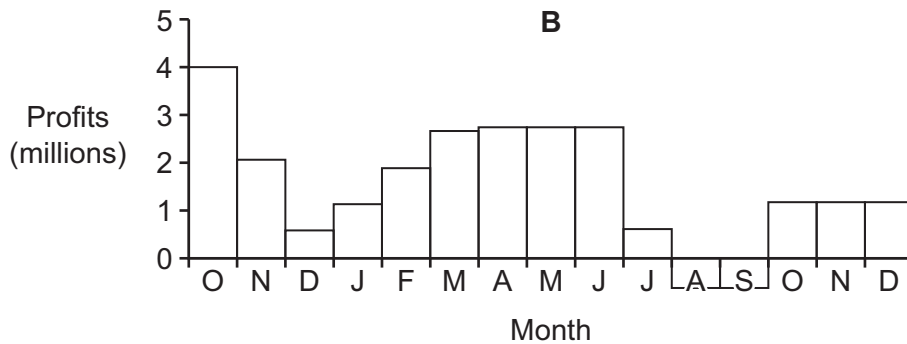
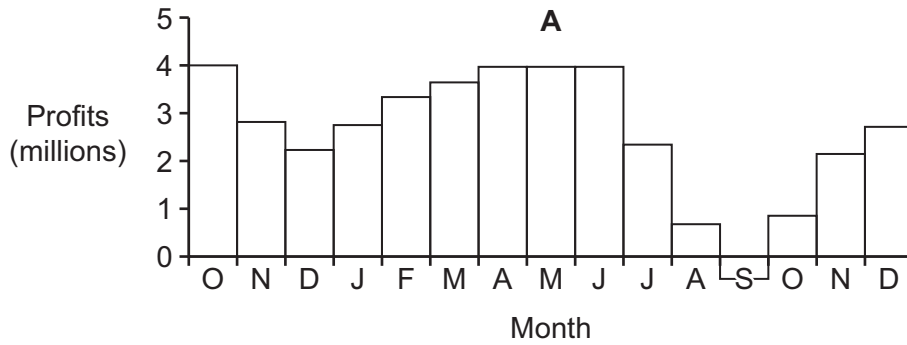
What are the middle two digits of my employee reference code?

- A** 25
- B** 36
- C** 49
- D** 64

16 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?



- 17 In my stamp collection I have 10 red and 9 green stamps. I have 9 from Canada and 10 from Japan. I have 1 pink stamp that is not from either Canada or Japan. 3 of my Canada stamps are red and 2 are green. 3 of my Japanese stamps are green and 4 are red.

What is the smallest number of stamps I could have in my collection?

- A 20  
 B 26  
 C 27  
 D 32
- 18 Dave wants to buy pet insurance for his cat, dog and pony. He has found four insurance companies, and the prices they charge for insuring individual animals are given in the table below.

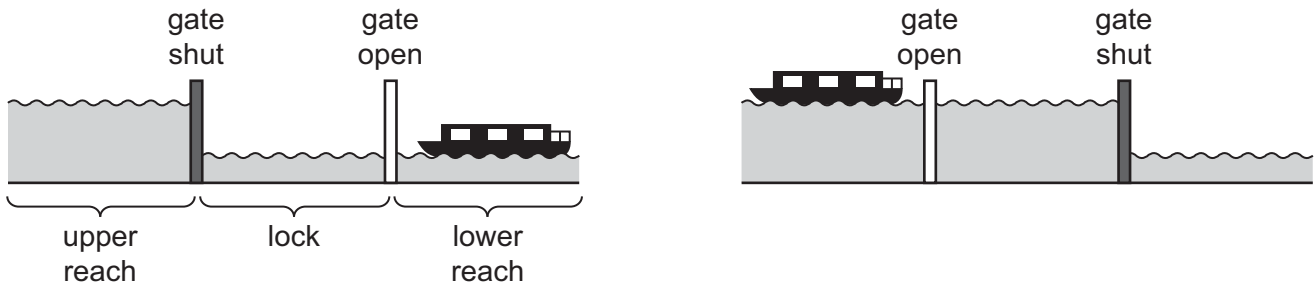
<i>Company</i>	<i>Cat (\$)</i>	<i>Dog (\$)</i>	<i>Pony (\$)</i>
A1 pets	35	50	195
Bestforpets	25	45	200
Callavetins	30	35	210
Dailysafety	25	40	220

The insurance companies all give discounts on the total bill if you buy insurance for more than one pet from them. A1 pets, Bestforpets and Callavetins all take \$5 off the total bill if you buy insurance for two pets and \$10 off if you buy insurance for three. Dailysafety takes \$10 off for two pets and \$15 off for three.

What is the lowest amount of money for which Dave can get all three of his pets insured?

- A \$245  
 B \$250  
 C \$255  
 D \$260

- 19 A canal lock is a mechanical device which allows the water level of the canal to rise or fall according to the changing levels of the surrounding countryside. Cross-sections of a canal are shown below.



Boats are raised and lowered in the lock as the level of water changes. When the lock is 'full' it contains 150 000 litres of water; when it is 'empty' it contains just 50 000 litres.

A particular lock is 'empty' when the first boat of the day arrives. Only one boat can pass through the lock at a time. The directional pattern of the first 9 boats to arrive is shown below. The boats use the lock in the order that they arrive.

Up	Down	Down	Down	Up	Up	Up	Up	Down
----	------	------	------	----	----	----	----	------

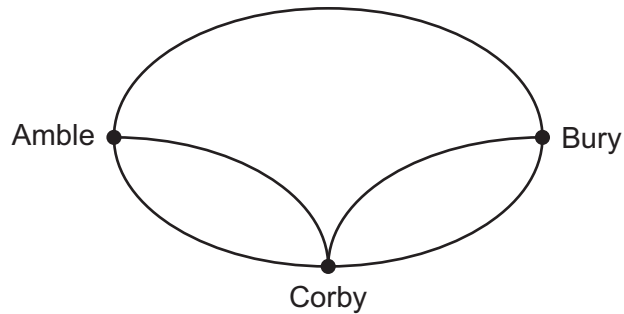
How many litres of water pass through the lock in order to move these boats?

- A 400 000  
 B 500 000  
 C 700 000  
 D 900 000
- 20 The 4-digit PIN for one of my credit cards consists of four different digits. The sum of the first two digits is 12 and the sum of the last two digits is 15.

Which one of the following additional pieces of information is sufficient by itself to enable deduction that the PIN is 7569?

- A First digit  $\times$  fourth digit = 63  
 B Second digit  $\times$  third digit = 30  
 C Third digit  $-$  second digit = 1  
 D Fourth digit  $-$  first digit = 2

- 21 Nurse Pat lives in Amble and on her rounds she has to visit the towns of Bury and Corby, in either order, before returning to Amble. The roads connecting these towns are represented in the diagram below.



Pat likes to vary the route that she takes, sometimes visiting Bury first and other times Corby, but never visits either town more than once on any particular journey.

How many different routes can she take?

- A 4  
 B 6  
 C 8  
 D 12
- 22 Donald has recently had a set of books printed for his employees. When he ordered the books he was told that the cost for each book would be calculated as follows:

\$1 for the cover and binding,  
 1¢ for each page in black and white,  
 2¢ for each page in colour.

Any order for more than 50 books receives a \$10 discount.

Donald originally ordered 40 identical books with 50 pages in each, but later needed to change his order. When he changed the order the total cost increased by \$4.

Which of the following could be the change that Donald made to his order?

- A The number of books ordered was increased to 45  
 B The number of books ordered was increased to 60  
 C 5 of the pages were changed from black and white to colour  
 D 10 of the pages were changed from black and white to colour

- 23** To access his bank account online, Max has to enter a 6-digit passcode. The bank requires him to change his passcode every month.

With 01, 31 or 61 representing A, 02, 32 or 62 representing B, through to 26, 56 or 86 representing Z, he always chooses a passcode that spells MAX. For instance, his current passcode is 433184.

How many of Max's possible passcodes contain no repeated digits?

- A** 6  
**B** 8  
**C** 9  
**D** 12
- 24** For the first stage of the Vispeck Football Tournament the teams were divided into groups of four, within which all the teams played against each other once.

The local newspaper reported on the tournament, publishing the results of all the matches and the final points tables. However, there was a printing error that caused the results and the points table for the Red group to be presented incomplete:

Giants	2	Herrings
Arrows	2	Carpets
Giants	2	Arrows
Herrings	0	Carpets
Carpets	3	Giants
Herrings	1	Arrows

	Played	Won	Drawn	Lost	Goals scored
Carpets	3	2	1	0	6
Arrows	3	1	1	1	6
Giants	3	1	1	1	5
Herrings	3	0	1	2	2

How many goals did the Carpets score against the Herrings?

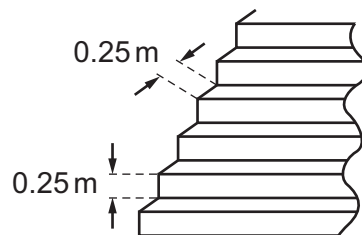
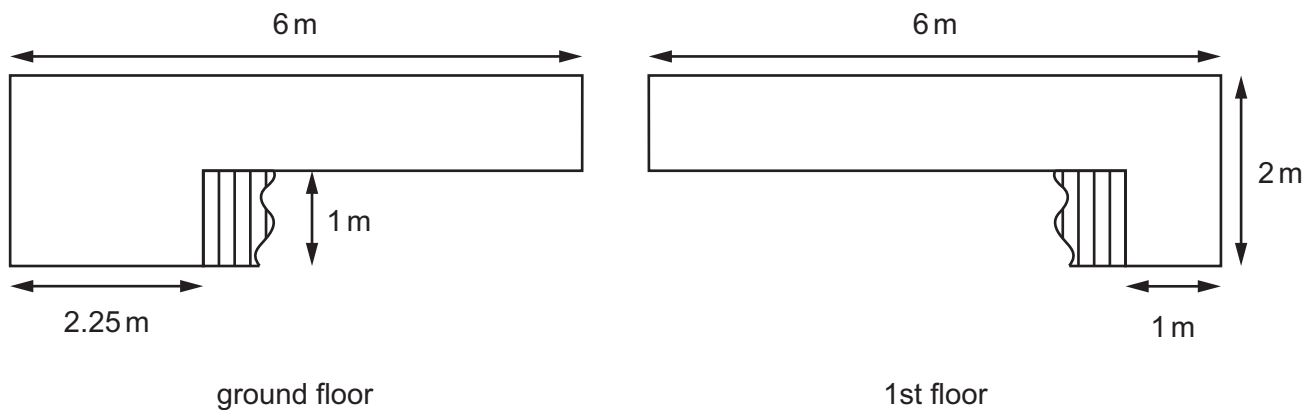
- A** 0  
**B** 1  
**C** 2  
**D** 3



- 25** Alice's journey to work every morning involves getting a bus and then walking for 20 minutes to get to the office. Yesterday she missed the bus and had to catch the next one. She then walked to her office in three quarters of the normal amount of time. She arrived at work 15 minutes later than usual.

Which of the following could explain the difference in Alice's arrival time?

- A** Buses run every 10 minutes  
**B** Buses run every 15 minutes  
**C** Buses run every 20 minutes  
**D** Buses run every 30 minutes
- 26** A ground floor reception area and 1st floor landing are to be carpeted. The carpet will be purchased from a 5 m wide roll, the length being a multiple of 10 cm. The dimensions of the areas to be carpeted are shown below.



The 1st floor and the stairs must be laid as a single piece; the ground floor area must also be one piece. 5% is added to the length of the total required carpet to take into account any error in measurements.

What length of carpet should be purchased?

- A** 6.0 m  
**B** 6.3 m  
**C** 6.8 m  
**D** 7.1 m

**27** George sells cans of beans at 40¢ each. A rival store sells them at 55¢ each, but has a “Buy 2, get 1 free” offer meaning that customers can buy three cans of beans at a lower price from that store. George wishes to introduce an offer so that no purchase of cans of beans at the rival store will be cheaper than a purchase of the same number of cans from his store. He is considering the following four different offers:

- Buy 1, get 1 free
- Buy 2, get 1 half price
- Buy 4 for \$1.50
- Buy more than 2 cans and all cans are 5¢ cheaper

He wishes to choose the offer that gives him the highest average price for a can of beans when a customer takes advantage of the offer.

Which offer should George choose?

- A** Buy 1, get 1 free
- B** Buy 2, get 1 half price
- C** Buy 4 for \$1.50
- D** Buy more than 2 cans and all cans are 5¢ cheaper

**28** The train journey from Offwego to Ellsware is a distance of 26 km. The train stops once en route: for 1 minute at Arwetheryet, 5 km from Offwego.

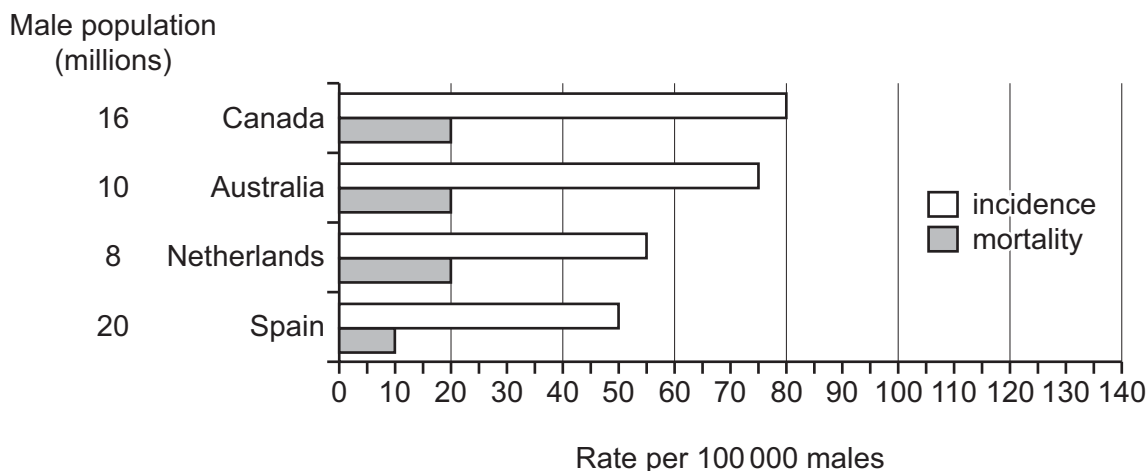
In both directions the train travels at an average speed of only 30 km/h between Offwego and Arwetheryet because of a series of bends, but travels at a steady speed of 90 km/h along the straight track between Arwetheryet and Ellsware.

Trains depart from Offwego and Ellsware every hour at exactly the same time.

How long after departure do the two trains pass each other?

- A** 11½ minutes
- B** 12 minutes
- C** 12½ minutes
- D** 13 minutes

- 29 Death rates of people suffering from cancer have been falling world-wide. Prostate cancer affects men and there have been increased rates of detection, which has helped the successful recovery from this disease. Data showing the comparative incidence of, and mortality from, this type of cancer for four different countries are given below.



Which country has the highest number of survivors from this type of cancer?

- A Australia  
 B Canada  
 C Netherlands  
 D Spain
- 30 In Aquadia each citizen can earn money by making fenced rectangular areas, for which they are paid at the rate of \$1 per square metre of area enclosed. Each citizen is only allowed to submit two rectangles per year. The sides of all rectangles must be made from single pieces of wood.

Alf has 6 pieces of wood 5 m long and 2 pieces 8 m long. Ben has 4 pieces that are 7 m long and 4 pieces that are 8 m long.

Alf and Ben realise that they could get more money between them if Alf gives Ben two of his pieces of wood and takes two of Ben's in exchange. Furthermore, if one of them pays the other an amount of money then they could each end up with more money than they could have made on their own.

Which of the following could be the payment that they make?

- A Alf gives Ben \$15  
 B Alf gives Ben \$24  
 C Ben gives Alf \$15  
 D Ben gives Alf \$24

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