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**THINKING SKILLS**

**9694/13**

Paper 1 Problem Solving

**October/November 2019**

**1 hour 45 minutes**

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

\* 7 5 1 7 9 8 0 7 0 8 \*

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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.

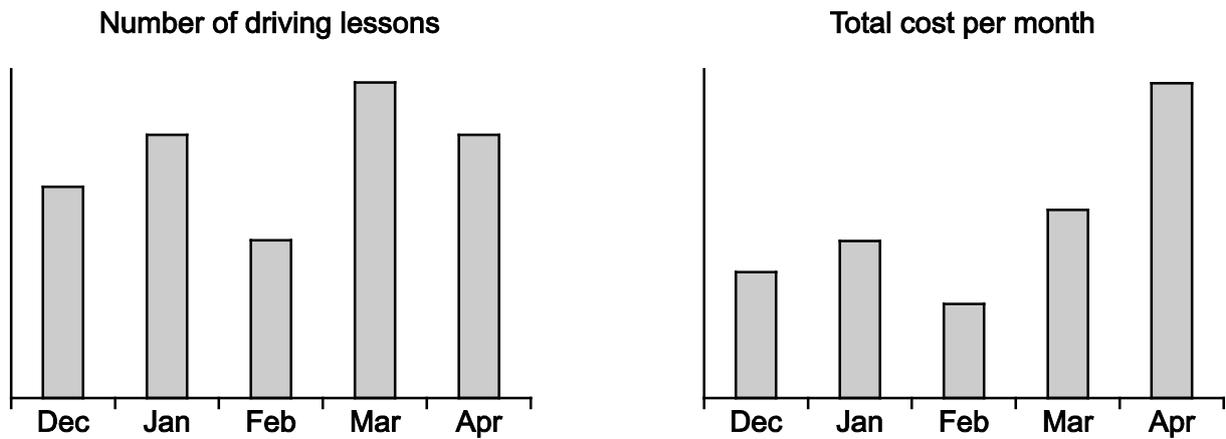
**INFORMATION FOR CANDIDATES**

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.

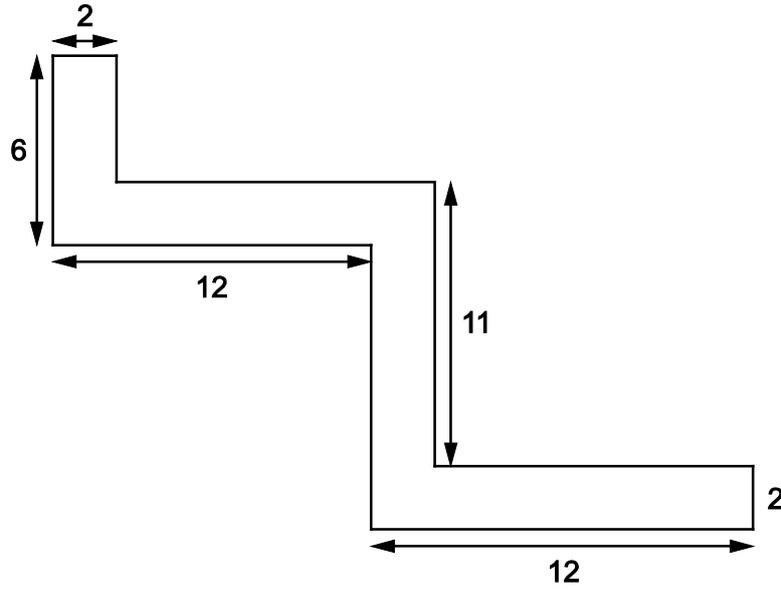
- 1 Barry took driving lessons during December to April. The number of driving lessons he took each month, and the total amount of money he spent on driving lessons each month, are shown in the graphs below. The driving instructor charges a fixed amount for each driving lesson, but at the beginning of one month he increased the price per lesson.



In which month was the cost of a driving lesson increased?

- A January
- B February
- C March
- D April

- 2 A hotel wishes to carpet a 2 m wide corridor as shown in the diagram below. All measurements are given in metres. The carpet can only be bought 4 metres wide, and whole number multiples of 1 metre in length. When cut and laid, the carpet must fill the corridor without overlapping.



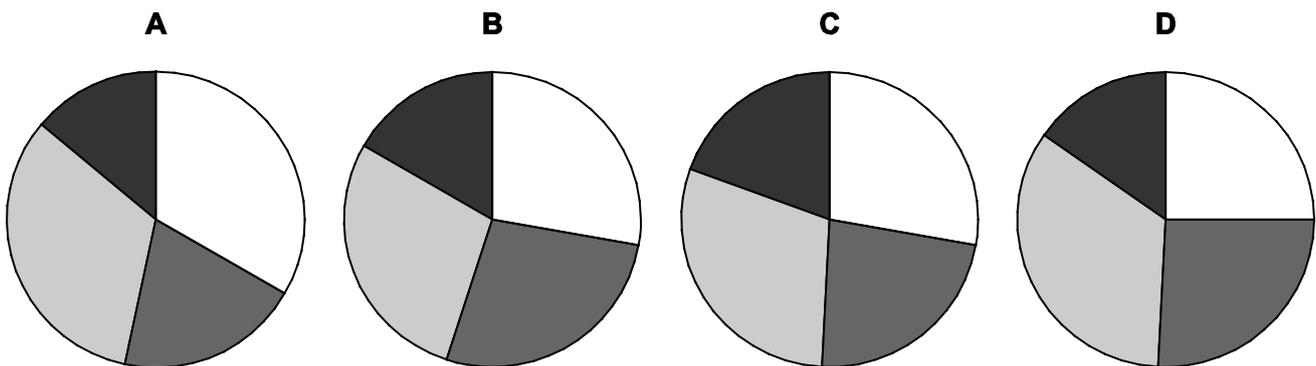
What is the shortest length of carpet that can be bought to satisfy these conditions?

- A 20 m
- B 21 m
- C 22 m
- D 23 m

- 3 The results of the recent competition between the four houses of the local school were as follows:

<i>House</i>	<i>Position</i>	<i>Total points</i>
North	2	100
East	3	83
South	1	107
West	4	70

Which of the following, if correctly labelled, could represent the number of points scored by each house?



- 4 Asa, Beatty, Celia and Dion are the four finalists competing for this year's Wotwenhoo Quiz Trophy. They have just completed four rounds of 25 questions each, with the following results:

	<i>Number of correct answers in:</i>			
	<i>Round 1</i>	<i>Round 2</i>	<i>Round 3</i>	<i>Round 4</i>
<i>Asa</i>	19	21	14	19
<i>Beatty</i>	19	17	19	20
<i>Celia</i>	17	16	22	17
<i>Dion</i>	20	17	21	15

Each correct answer is worth one point, but before the results are processed and the trophy awarded to the competitor with the greatest total, each competitor's poorest round is discarded and the score for their best round is doubled.

Who has won this year's Wotwenhoo Quiz Trophy?

- A** Asa  
**B** Beatty  
**C** Celia  
**D** Dion

- 5 4050 charity leaflets need to be packed into envelopes. Yesterday 3 people worked for 1 hour and packed 450 leaflets altogether. They all worked at the same rate. Continuing the job today, they have an extra person to help and they start work at 8.00 am. Everyone today works at the same rate as the people did yesterday.

If they do not take any breaks, at what time will they finish the job?

- A 2.00 pm  
 B 2.45 pm  
 C 4.00 pm  
 D 5.00 pm
- 6 A car showroom sells cars at a steady rate of 1 per day. When its stock gets down to 6 it takes delivery of another 20 cars. This policy has been going on for some time, but having expanded the showroom the management decide they will take delivery of 30 cars whenever the stock gets down to 10. They still expect to sell 1 car per day.

How will the average number of cars in the showroom between deliveries change compared with the average under the old policy?

- A It will increase by 4  
 B It will increase by 9  
 C It will increase by 10  
 D It will increase by 14
- 7 50 students were asked whether they enjoy TV and whether they enjoy rock climbing. The results are given below.

	Enjoy rock climbing	Do not enjoy rock climbing	Total
Enjoy TV	23	16	39
Do not enjoy TV	5	6	11
Total	28	22	50

Which of the following statements is **not** correct?

- A Most of the students who enjoy rock climbing also enjoy TV  
 B Most of the students who do not enjoy rock climbing do enjoy TV  
 C Most of the students who enjoy TV also enjoy rock climbing  
 D Most of the students who do not enjoy TV do enjoy rock climbing

- 8 Five friends are waiting in a queue. Philip is shorter than Quentin. Raymond is shorter than Philip. Sandra is taller than Raymond but Sandra is shorter than Quentin. Tanya is shorter than Sandra.

Which of the following people **cannot** be the third-tallest?

- A Philip
  - B Raymond
  - C Sandra
  - D Tanya
- 9 A version of the Cyrillic alphabet is used in Ukraine, but to make it easier for international travel, the letters in new car number plates have been chosen to be those that appear in both the Ukrainian alphabet

А Б В Г Г' Д Е Є Ж З И І Ї Й К Л М Н О П Р С Т У Ф Х Ц Ч Ш Щ Ъ Ю Я

and the 'latin' alphabet

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z .

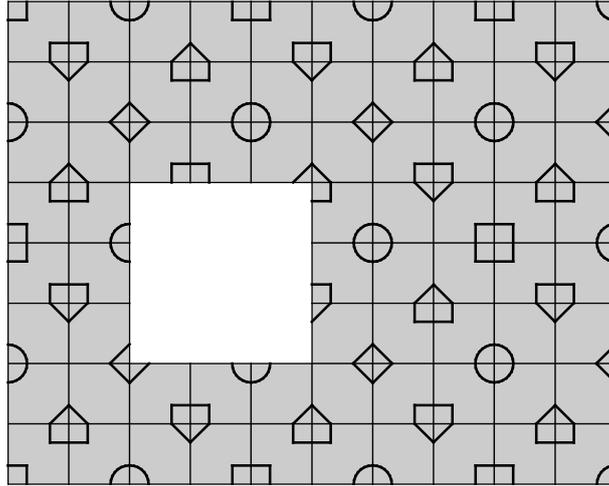
(It does not matter if the sound is different.)

There are two letters in front of the digits, e.g. YY 325176 or MO 201322.

How many different sequences of two letters could appear at the start of a number plate?

- A 26
- B 78
- C 121
- D 169

10



This is part of a tiled wall in my house that has a regular, repeating pattern. Nine tiles have fallen off the wall and broken, leaving a square space.

Which one of the following tiles could be used to replace the central tile of the group of nine?



- 11 Mehrdad holds the Persepolian national record for running 800 m, with a time of 1 minute 48 seconds. He is going to race in Decimalia, which uses a very different method of representing time. In Decimalia, instead of 24 hours, there are just 10 D-hours in the day, with each D-hour divided into 100 D-minutes, and each D-minute divided into 100 D-seconds. He hopes to run the same distance exactly as fast as he did when claiming the Persepolian national record.

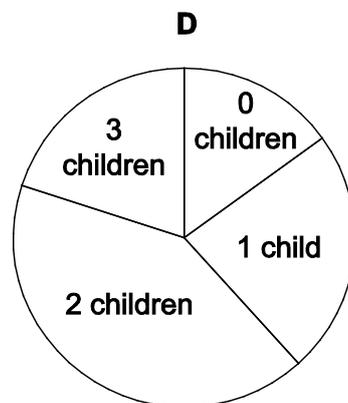
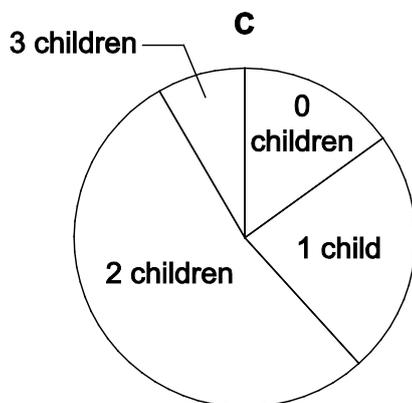
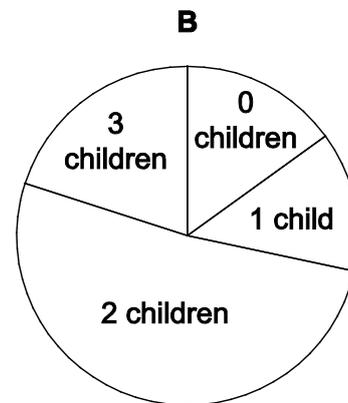
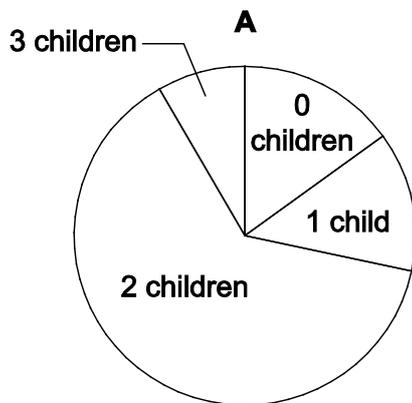
If Mehrdad runs at the same speed as he did when setting the record, what time will be recorded for his run in Decimalia?

- A** 75 D-seconds  
**B** 1 D-minute 15 D-seconds  
**C** 1 D-minute 25 D-seconds  
**D** 2 D-minutes 5 D-seconds

- 12 The following table shows the distribution of boys and girls amongst the 60 households of Sibb Road.

	0 boys	1 boy	2 boys	3 boys
0 girls	9	4	14	2
1 girl	4	6	4	0
2 girls	11	3	0	0
3 girls	3	0	0	0

Which one of the following pie charts shows the distribution of children amongst the households of Sibb Road?



- 13** The Oeschinen gondola lift takes visitors from Kandersteg to Oeschinen, 800 metres above the village. It has 20 gondolas, mounted on a continuous cable. Each gondola can carry 8 people. A gondola leaves each station at 1 minute intervals and takes 10 minutes to complete the journey. At busy times each gondola is loaded to full capacity.

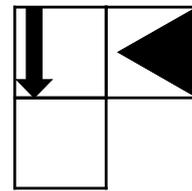
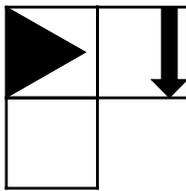
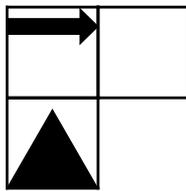
John plans to take the gondola to the top, walk down to Lake Oeschinen, spend an hour having lunch at a lakeside restaurant while he admires the scenery, return to the top station and take the gondola back to the village.

The walk to the lake takes 20 minutes on the outward journey and 30 minutes, uphill, on the return journey.

John arrives at the lower station at 11:00 as a gondola is leaving and is number 74 in a long queue. On the return journey a gondola has just left and there are 8 people in front of him.

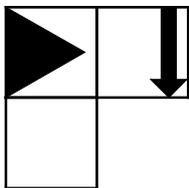
At what time will John arrive at the bottom station?

- A** 13:10  
**B** 13:13  
**C** 13:22  
**D** 13:24
- 14** Thomas is designing a puzzle made of four pieces. Each piece is made of three squares and when they are put together correctly they will form a 3 x 4 grid of squares. The design will also have two lines of symmetry. Three of the pieces are shown below.

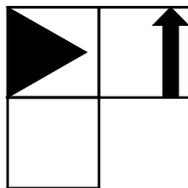


Which of the following could be the final piece?

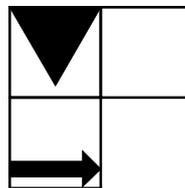
**A**



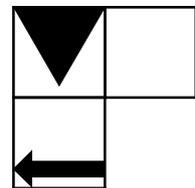
**B**



**C**



**D**



- 15** A cable car operates every half hour between the bottom and the top of a steep hill. The car going up is balanced by the car going down. The motor is so weak that the cars will not move unless there are at least as many passengers in the car going down as the car going up, but many more people are prepared to pay to go up than go down.

The operating company estimates that for each trip there are 40 people who would like to go up, if there was no fare, but for each \$0.10 extra of fare one person is deterred from travelling. (Thus, if the fare was \$0.50 there would be 35 passengers.)

There would be 10 people wanting to take the down trip if there was no fare, but to get more than this the company would have to pay passengers. Each extra payment of \$0.05 attracts an extra passenger. (So a payment of \$0.50 to each passenger would mean 20 passengers wanted to take the down trip.)

What fare should be set for up-passengers that will make the most money for the company, taking into account any payment it makes to down-passengers?

- A** \$1.00
- B** \$2.00
- C** \$2.50
- D** \$3.00

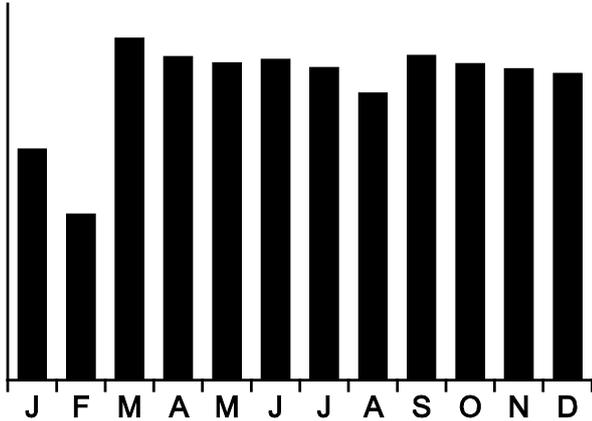
16 Monthly new car sales of the Spaghini 2000 during 2016 are shown in the table below.

Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
154	68	464	176	194	228	172	72	425	157	172	166

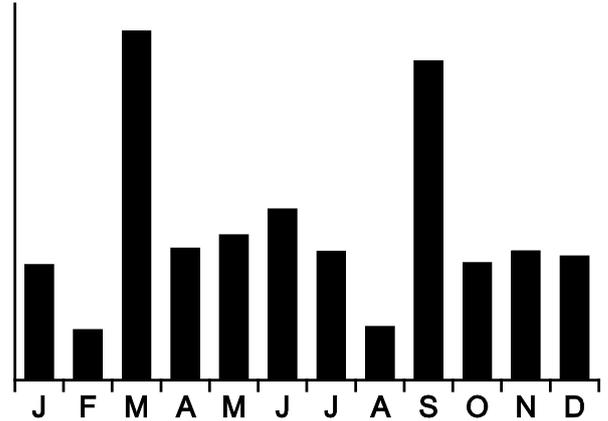
Toni is asked to produce a chart showing what, at the end of each month, the average monthly sales were for the year so far.

Which of the following is the chart Toni should produce?

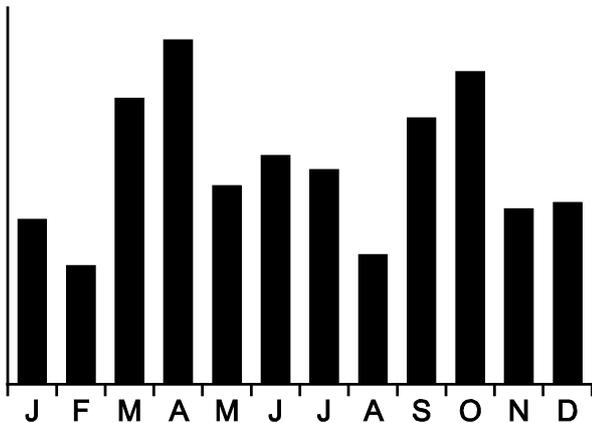
**A**



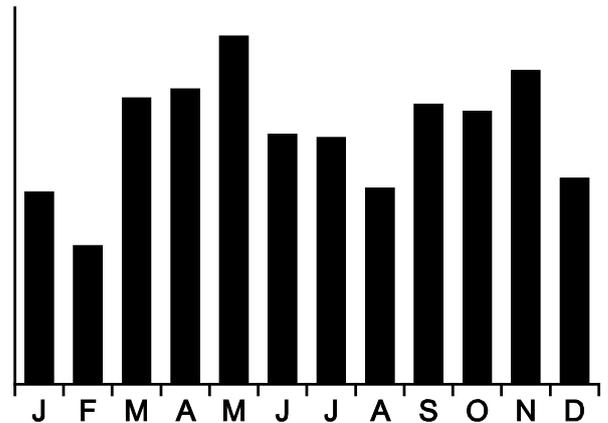
**B**



**C**



**D**



17 Andy, Ben, Charlie and Dan are the usual four members of a rowing crew.

Dan injures his leg and is unable to row. He is replaced in the crew by Eddie.

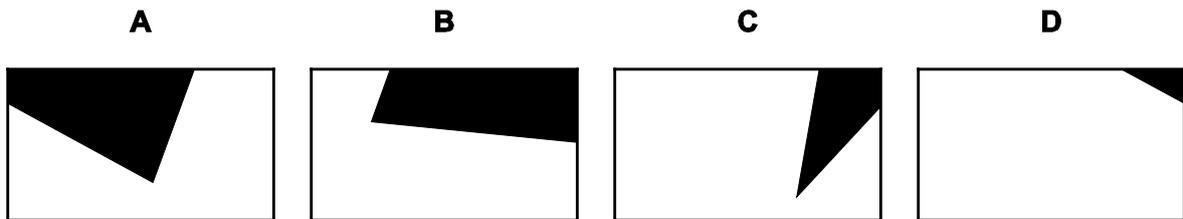
The average weight of the new crew, consisting of Andy, Ben, Charlie and Eddie, is 2 kg less than the average weight of the original crew.

Which one of the following additional pieces of information is **not** sufficient to find Eddie's weight?

- A Dan weighs 80 kg
- B Eddie is 12.5% lighter than Dan
- C The average weight of Dan and Eddie is 76 kg
- D The total weight of the original crew is 450 kg

18 A large rectangular poster showing a black triangle is made up from four smaller rectangular pieces.

Which one of the pieces has been printed incorrectly?



- 19** Steve Lumber sells airbeds. To celebrate the 10th anniversary of his store opening, he decides to hold a competition to see who can blow up an airbed in the least time. In order to showcase his range, he uses three different airbeds.

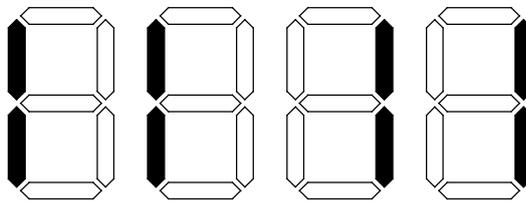
Contestant 1 has a standard single bed with a volume of 150 litres, and will be using an air compressor which will deliver between 26 and 30 litres per minute.

Contestant 2 has a double bed with a volume of 450 litres and has a 0.5-litre hand pump, which she can operate at 3 pumps per second.

Contestant 3 has a queen-sized bed, also with a volume of 450 litres, and is equipped with a 3-litre foot pump which he can operate at 25 pumps per minute.

Which one of the following outcomes is possible?

- A** Contestants 1 and 2 complete the race at the same time
  - B** Contestants 1 and 3 complete the race in the same time
  - C** Contestant 3 wins by 1 minute
  - D** Contestant 1 wins by more than 1 minute
- 20** Escherman's digital counters have a four-digit display. When a 1 appears in either of the two right-hand digits, it is shown by blocking out the two bars on the right; when a 1 appears in either of the two left-hand digits, it is shown by blocking out the two bars on the left. This gives their displays a pleasing symmetry, as shown below.



How many numbers between 1501 and 9999 will have a vertical line of symmetry?

- A** 14
- B** 15
- C** 17
- D** 20

- 21** The local science museum needs to raise a certain amount of money every week to pay its running costs. The entrance fee is \$10 for adults and \$8 for children. Last week 140 adults and 100 children visited the museum and the money raised from their entrance fees was just enough to cover the running costs.

This week however the running costs will be \$100 more than last week. Tina assumes that the same number of people will visit this week, and so has decided to increase the entrance fee to \$12 for adults and \$9 for children. She is also going to introduce a family ticket, which will admit 2 adults and 2 children. She predicts that 40 of these family tickets will be sold.

What is the cheapest price for the family ticket that will raise the required amount of money?

- A** \$33
  - B** \$35
  - C** \$37
  - D** \$41
- 22** Hattie knew that 5 people wanted tea: 3 with milk, 2 with sugar. Unfortunately, she did not know how many wanted both milk and sugar.

Which of the following would enable her to make the right 5 drinks, even if she could not work out which was for whom?

- A** Simon takes just sugar and Nelly takes neither
  - B** Nelly takes neither and Malcolm takes just milk
  - C** Betty takes both and Nelly takes neither
  - D** Malcolm takes just milk and Simon takes just sugar
- 23** Marc lives in Bolandia, where the only coins in circulation are 50¢, 25¢, 20¢, 10¢ and 5¢.

The daily newspaper that Marc reads costs 60¢. Normally he pays for it with a 50¢ coin and a 10¢ coin. However, recently he has been investigating how many different combinations of coins he can use to pay the exact price. He has already discovered that there are only 3 ways of paying 60¢ using exactly 3 coins, as follows:

$$\begin{aligned} &50¢ + 5¢ + 5¢ \\ &25¢ + 25¢ + 10¢ \\ &20¢ + 20¢ + 20¢ \end{aligned}$$

How many ways are there to use exactly 4 coins to pay 60¢ for Marc's newspaper?

- A** 3
- B** 4
- C** 6
- D** 7

- 24** Andrew works from 8.30 am to 5.00 pm each day, operating a machine that makes splindons. He is allowed a total of  $1\frac{1}{2}$  hours in breaks during the day.

First thing each morning, and after every break, the machine requires 6 minutes to warm up before any splindons can be made.

Andrew normally takes one  $1\frac{1}{2}$  hour break at lunchtime, and produces splindons at an average rate of 3 per minute.

Yesterday he tried a different routine. He had a 20 minute break mid-morning, a 50 minute lunch break and a 20 minute break mid-afternoon. The result was that he was able to keep up an average production rate of  $3\frac{1}{2}$  splindons per minute throughout the day.

How many more splindons did Andrew produce yesterday than he usually does?

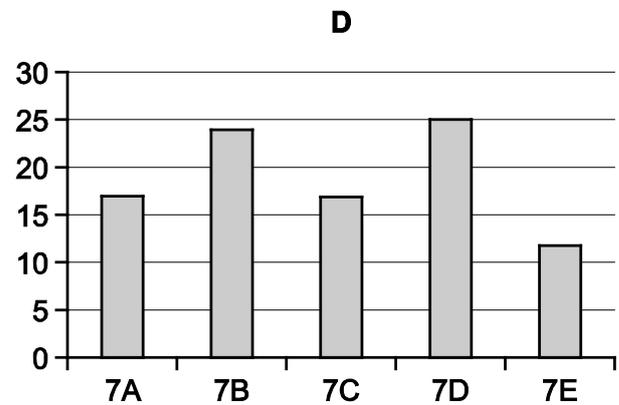
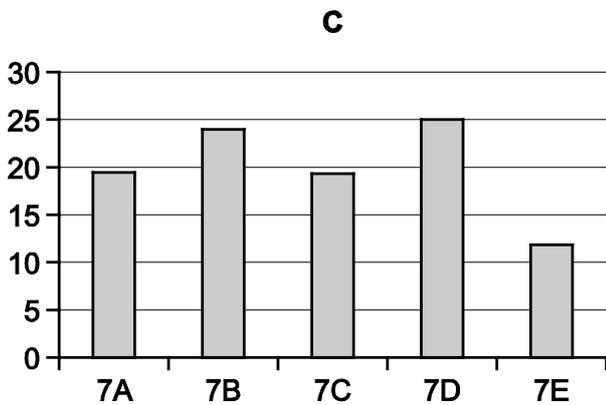
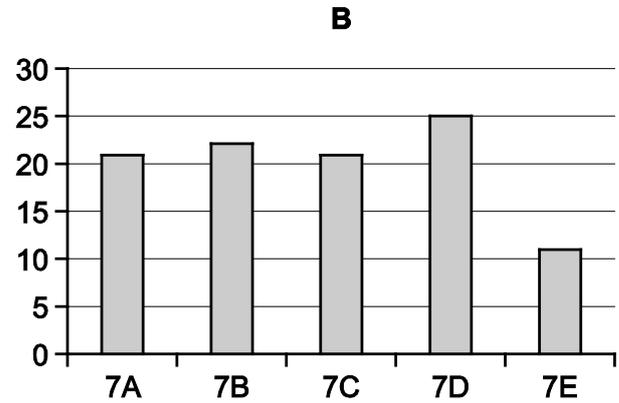
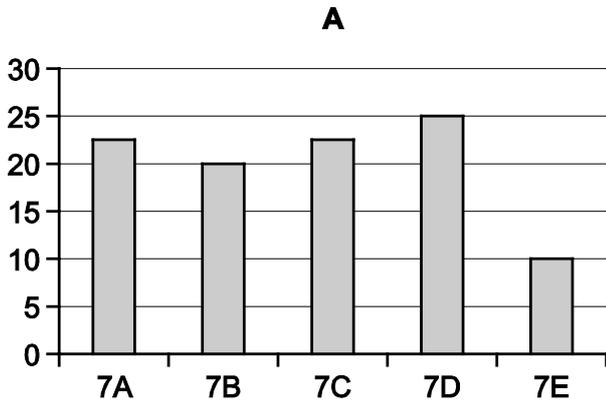
- A** 126
  - B** 162
  - C** 210
  - D** 246
- 25** A company decides to give bouquets of flowers to its top 15 female employees. Each bouquet is to consist of 10 cream roses and 2 lilac roses. The roses are supplied by a garden nursery in boxes containing only cream roses and lilac roses. Each box contains at least 30 roses and at most 36 roses in total. The nursery is able to guarantee that each box contains at least 8 lilac roses and at most 12 lilac roses.

What is the minimum number of boxes of roses that the company needs to buy in order to ensure that it has a sufficient number of each colour of rose to make the required bouquets?

- A** 4
- B** 6
- C** 7
- D** 9

- 26 The students in Year 7 of the local school have just finished their fundraising activities. 7D was the class that collected the most money, raising a quarter of the final total. Of the other classes, 7E raised the smallest amount, which was exactly half the amount raised by 7B. 7A and 7C each raised the same amount.

Which of the following bar charts could **not** represent the amounts raised by each class?



- 27** I took part in a quiz last night. There were 40 questions. Each correct answer scored 2 points, with 1 point deducted for every wrong answer. There was no penalty for questions that were not attempted.

The winning team scored 57 points. The runners-up scored 54 points, despite having 2 more correct answers than the winners.

How many wrong answers did the runners-up have?

- A** 6
- B** 7
- C** 8
- D** 9

- 28** Huck and Tom meet for a walk.

Huck says he will walk alternately north and east.

He will go 3 minutes north, 5 minutes east, 7 minutes north, 9 minutes east, 11 minutes north, 3 minutes east, 5 minutes north etc.

Tom says he will walk alternately east and north.

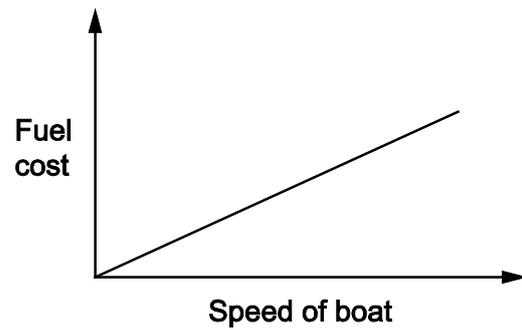
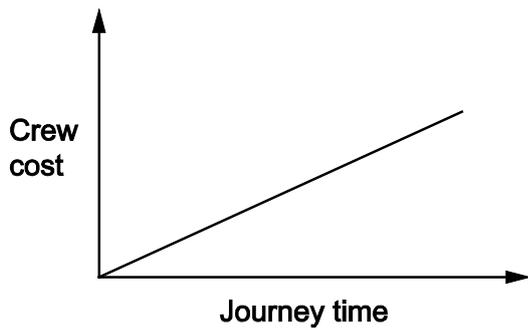
He will go 11 minutes east, 9 minutes north, 7 minutes east, 5 minutes north, 3 minutes east, 11 minutes north, 9 minutes east etc.

They will set off at the same time and walk at exactly the same speed.

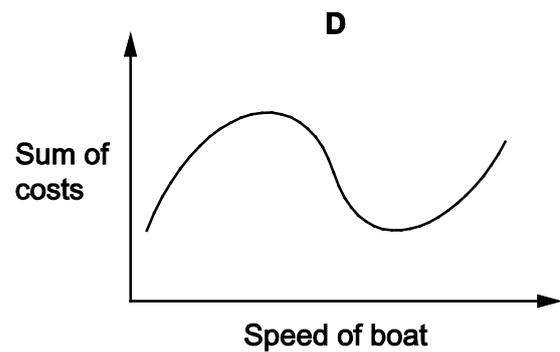
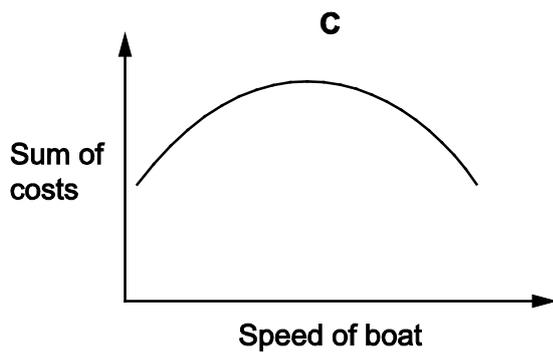
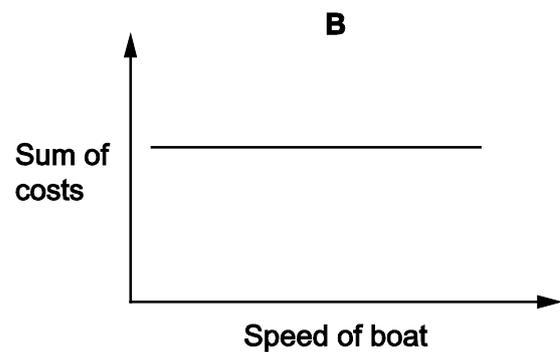
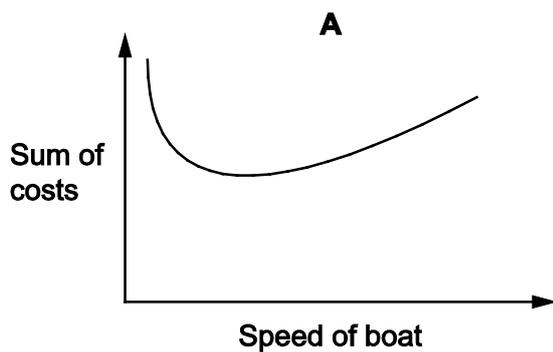
How long will it be after they first set off that their paths will cross again?

- A** 35 minutes
- B** 1 hour 10 minutes
- C** 1 hour 45 minutes
- D** 2 hours 20 minutes

- 29 A boat owner has two major costs: the cost of the crew and the cost of fuel. The crew are paid by the hour, so the slower the boat goes the more the crew costs – but the slower the boat goes the less fuel it uses. In fact, the owner has noted that the sum of the costs is the same if the boat goes at 2 km/h or 36 km/h. The crew costs and fuel costs are represented by the graphs below.



Which of the following graphs could represent the relationship between the sum of the two major costs and the speed of the boat?



- 30 Sergio has to arrange transport for 60 people on a journey of 600 kilometres. There is a choice of vehicle types he can rent for this journey. They go at different speeds and can carry differing numbers of people, but all the vehicles cost \$10 per hour of use. The speeds and capacities of all the vehicle types are shown in the table below.

<i>Vehicle</i>	<i>Capacity</i> (passengers it can carry)	<i>Speed</i> (km/h)
Tini	1	100
Mini	2	60
Medi	3	50
Fami	4	40
Maxi	5	30
Grandi	6	20

Sergio doesn't care how long the journey takes; he simply wants to arrange the journey so that it costs as little as possible. Accordingly he chooses to use the vehicles that result in him paying the least amount possible for their use.

How much does Sergio have to pay per passenger for use of the vehicles?

- A \$32.50
- B \$37.50
- C \$40.00
- D \$50.00

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