

THINKING SKILLS

9694/11

Paper 1 Problem Solving

May/June 2014

1 hour 30 minutes

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

* 5 4 0 3 5 9 6 0 4 0 *

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.

This document consists of **18** printed pages and **2** blank pages.

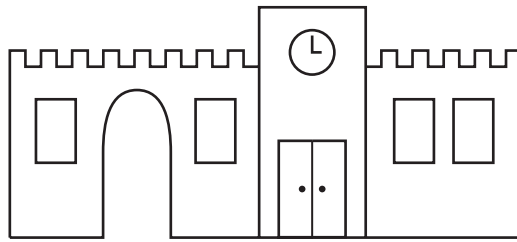
- 1 I am planning to buy a book on computer programming. I need the book to be about the 'C' programming language and I need it to include a section on working with databases. The shop will give me a 10% discount on some of the books. I only have \$20 to spend, but I want to buy the most expensive book that I can afford. The table shows the books that I could choose from:

<i>Book title</i>	<i>Cost (\$)</i>	<i>Languages covered</i>	<i>Includes databases?</i>	<i>10% discount available?</i>
A first guide to programming	10	BASIC and C	Yes	Yes
Programming: A beginner's guide	25	C	No	No
Simple programming tips	15	C	Yes	Yes
The programmer's guide	20	BASIC	Yes	No

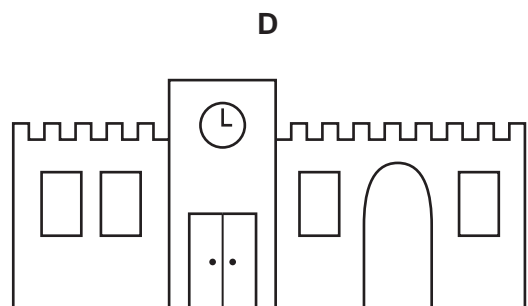
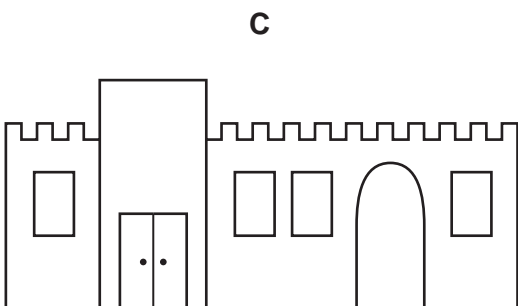
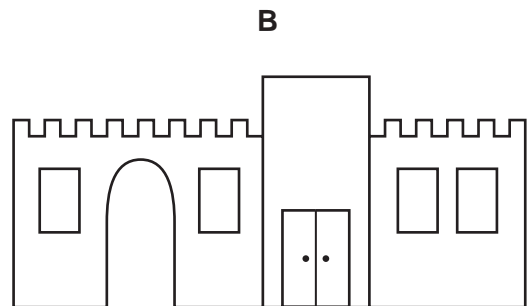
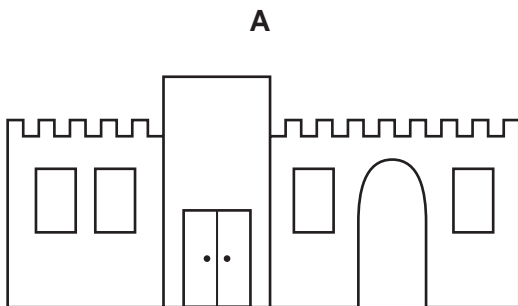
Which book should I buy?

- A A first guide to programming
- B Programming: A beginner's guide
- C Simple programming tips
- D The programmer's guide

- 2 This is a diagram of the eastern side of a university library, with a clock tower in the centre. All the windows on the east of the building are exactly duplicated, in size and in position, on the western side. There is a door to the clock tower on the western side of the building, but there is no clock face on the western side.



Which of these diagrams is a possible view of the western side of the building?



- 3 The steam room in the local spa has three coloured lights, with a cycle that repeats every 60 seconds. The red light comes on for 30 seconds. Twenty seconds after it starts, the green light comes on for 30 seconds. Twenty seconds after the green light starts, the blue light comes on for 30 seconds.

Unfortunately, the blue light has now broken, but the others continue as normal.

For how much time each minute is there now no light on?

- A** 0 s
- B** 10 s
- C** 20 s
- D** 30 s

- 4 Before a change of government, the Bolandian retirement fund allowed a maximum investment of \$10 000 per year. The rules were then changed to allow more than \$10 000 to be invested in a year. To invest more than \$10 000, the full allowance of the current year must be used and the extra must use some of the spare allowance from the previous three years. The oldest spare allowance is used up first.

Alfred invested \$9000, \$6000, and \$8000 into the fund in the three years before the change. He then invested \$12 000 two years ago and \$14 000 last year.

What is the maximum he may invest this year?

- A \$10 000
 B \$11 000
 C \$12 000
 D \$17 000
- 5 I have three video tapes and one camcorder tape and I wish to convert them all to Blu-Ray. I want to have one camcorder tape converted to a computer file as well. The prices for conversions are shown in the table below.

		<i>Transfer from</i>		
		<i>Video tape</i>	<i>Camcorder tape</i>	<i>Film reel</i>
<i>Transfer to</i>	<i>DVD</i>	\$3	\$4	\$6
	<i>Blu-Ray</i>	\$4	\$5	\$8
	<i>Computer file</i>	\$1	\$2	\$3

What will be the total cost of the conversions?

- A \$15
 B \$17
 C \$18
 D \$19

- 6 Daisy wants to get from Ambridge to Darrington and it is important that she arrives before 13:00. To get to Darrington, she can take a bus from Ambridge to Borchester or Collyweston and change buses at either place. The morning timetables for buses on these routes are given in the table below.

<i>Route 127 Ambridge to Borchester</i>		<i>Route 135 Ambridge to Collyweston</i>		<i>Route 180 Borchester to Darrington</i>		<i>Route 211 Collyweston to Darrington</i>	
<i>Depart</i>	<i>Arrive</i>	<i>Depart</i>	<i>Arrive</i>	<i>Depart</i>	<i>Arrive</i>	<i>Depart</i>	<i>Arrive</i>
07:10	08:05	08:00	08:45	08:30	09:10	09:00	09:50
08:10	09:05	09:30	10:15	09:15	09:55	09:50	10:40
09:10	10:05	10:15	11:00	10:00	10:40	10:40	11:30
10:10	11:05	11:00	11:45	10:45	11:25	11:30	12:20
11:10	12:05	11:30	12:15	11:30	12:10	12:20	13:10
12:10	13:05	12:15	13:00	12:00	12:45	13:10	14:00

What is the shortest possible time in which Daisy, setting out from Ambridge, can arrive in Darrington, and be there before 13:00?

- A 1 hour 35 minutes
 B 1 hour 40 minutes
 C 1 hour 45 minutes
 D 1 hour 50 minutes
- 7 This morning I took my three children to an internet café.
- Jay used the internet for 37 minutes and was charged \$17.40, whilst Kay's 56 minutes cost \$20.25 and Harry had to pay \$19.05 for the 48 minutes that he spent online.

Which of the following formulae does this café use to charge for its internet facilities?

- A $\$4.65 + \0.30 per minute
 B $\$8.15 + \0.25 per minute
 C $\$9.05 + \0.20 per minute
 D $\$11.85 + \0.15 per minute

- 8 A car travels 400 kilometres and has a fuel consumption of 5 kilometres per litre. The range of the car on a full tank is 500 kilometres. During the journey, the car is refuelled three times. On the first occasion it is refuelled with 30 litres, the second time with 50 litres and the third time with 30 litres. The car ends its journey with half a tank of fuel.

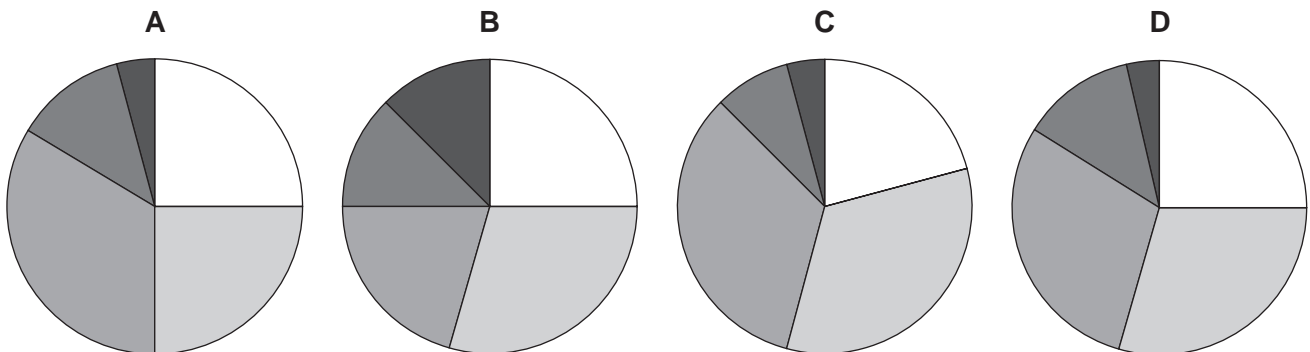
How much fuel did the car have in the tank at the start of the journey?

- A 20 litres
 B 80 litres
 C 100 litres
 D 110 litres
- 9 A teacher gave his students the following advice about how to organise their time:

You should be asleep for 6 hours every day;
 You should spend the same amount of time studying at home as you spend in lessons;
 You should not spend more than 3 hours a day playing computer games.

A student drew a pie chart to represent this advice, using sections for sleep, studying at home, studying in lessons, playing computer games and a section for all other activities.

Which of the following pie charts could be the one that the student drew?



- 10 Jenny's monthly broadband bill with her current supplier is \$16. She is considering changing to a new provider, but they all insist on a minimum 2-year contract.

Which of the following alternative contracts would give her the lowest average monthly bill over the next two years?

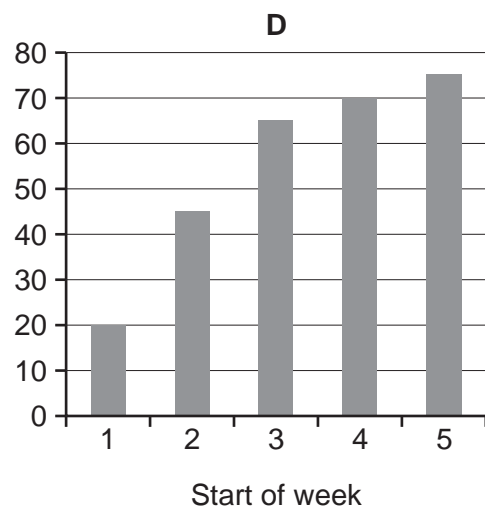
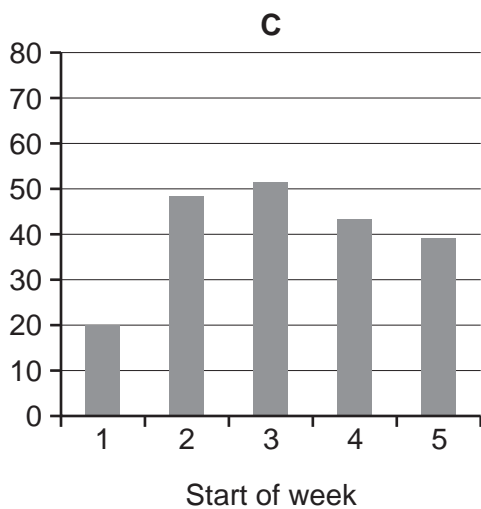
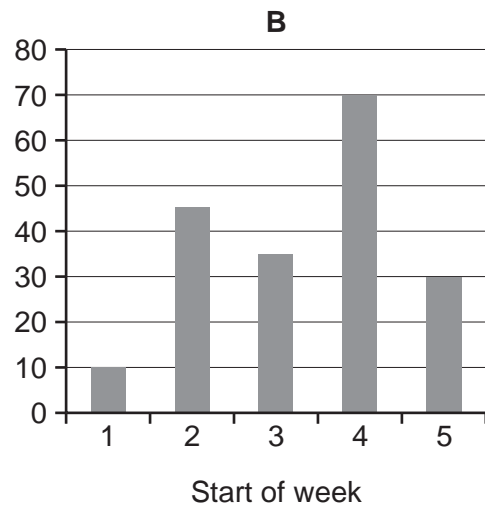
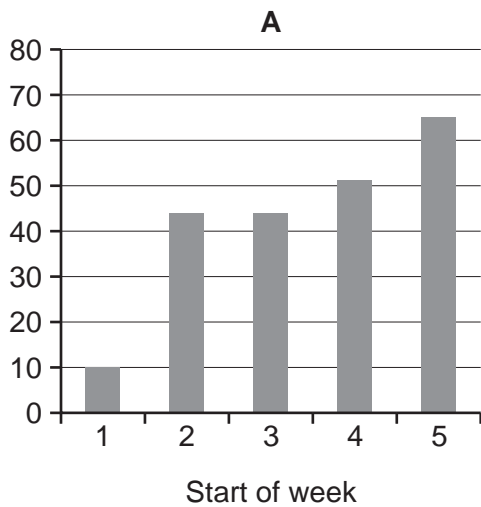
- A \$10 a month for the first 6 months, then \$20 per month
 B 3 months free, then \$18 per month
 C \$30 sign-on fee, then \$13 per month
 D \$80 for the first year, then \$24 per month

- 11 Books can be borrowed from the library for 2 weeks at a time. Books are always out of the library for at least one week but are often returned after just one week rather than two. During each of the last 4 weeks the following numbers of books have been taken out:

Week 1 – 40
 Week 2 – 32
 Week 3 – 43
 Week 4 – 28

All of the books were returned on time, or early.

Which one of the bar charts could **not** represent the number of books that were out of the library at the start of each week?



- 12 A train service runs between Malaga Central Station and Fuengirola. Trains from Malaga Central Station start at 07:00 and then run every 30 minutes until 22:30. The arrival of the first train at Malaga Central Station is 07:57 and trains arrive every 30 minutes thereafter.

During a stay in Malaga, a tourist plans to visit Los Almos, Torreblanca and Los Boliches. She wishes to stop for at least 30 minutes, 45 minutes and 1 hour 20 minutes at each place respectively.

00	30	Malaga Central Station	27	↑	57
05	35	San Andre	22		52
08	38	Guadalhorce	19		49
10	40	Airport Cargo Terminal	17		47
13	43	Airport	14		44
15	45	San Julian	12		42
18	48	Los Almos	09		39
20	50	La Collina	07		37
23	53	Torremolinos	04		34
25	55	Montemar Alto	02		32
28	56	Al Pinillo	01		31
30	00	Benalmadena	57		27
33	03	Torremuelle	54		24
36	06	Carvajal	51		21
38	08	Torreblanca	49		19
40	10	Los Boliches	47		17
42	↓	12	45		15
		Fuengirola			

If the tourist plans to leave Malaga Central Station at 09:30, what is the earliest time she could arrive back at Malaga Central Station?

- A 10:57
- B 12:57
- C 13:27
- D 13:57

- 13** Last week I took a memory card to Gilberts Photography to get some photos printed.

I was given the choice of next-day printing at 30 cents per print or one-hour printing at 50 cents per print. I had a voucher that entitled me to either \$7.50 off next-day printing or 50% off one-hour printing, subject to a minimum order of 40 prints.

The one-hour printing turned out to cost me \$1.75 less than the next-day printing would have done.

How many prints did I order?

- A** 115
- B** 145
- C** 185
- D** 225

- 14** I have decided to invest my savings of \$1000 for a year. However, I want to deposit it in only one account and take it out at the end of the year.

The best four choices on the market are as follows:

CROESUS BANK – 5% per annum interest; the account is for a fixed term of six months but can be renewed; minimum investment \$1000. Loyalty bonus for customers on interest paid after 18 months of 0.5%.

MOUNTIE BANK – 4% per annum interest; minimum investment \$250 with an annual bonus of \$7.50 for each \$500 deposited.

MIDAS BANK – 6% per annum interest; maximum investment \$900.

ARGENT BANK – 3% per annum – but a bonus of double the interest if retained for a year. Administration charge of \$3 for withdrawals.

Which bank should I choose to get the highest return?

- A** CROESUS BANK
- B** MOUNTIE BANK
- C** MIDAS BANK
- D** ARGENT BANK

- 15** If I want to cut a piece of paper into 4 pieces without folding it, it takes me a minimum of 2 cuts with a pair of scissors (by cutting once then laying one on top of the other before the second cut). To cut it into 5 pieces, it will take me at least 3 cuts as I will have to cut one of my 4 pieces into 2.

I want to write some notes to 15 friends. Starting with a single sheet, and not folding any of the pieces, what is the minimum number of cuts I will have to make to get exactly 15 pieces of paper?

- A** 4
- B** 5
- C** 6
- D** 7

- 16 Of the 24 students in a class, 11 take German and 16 take Chemistry.

What is the smallest number that could take Chemistry but not German?

- A 3
 - B 5
 - C 8
 - D 13
- 17 The Spaydart Club has four categories of membership, each with a different annual subscription, as detailed below.

<i>Membership category</i>	<i>Annual subscription</i>
Adult	\$50
Senior citizen	\$30
Student	\$20
Junior	\$10

At last night's management committee meeting, the treasurer announced that the club currently has 98 adult members, 75 senior citizen members, 64 student members and 31 junior members, producing a total annual income from subscriptions of \$8380.

When somebody pointed out that, according to the membership figures, the total income should be \$8740, the treasurer realised that he had transposed the two digits of the number of members in one of the categories.

Which of the following should the treasurer have announced?

- A 13 junior members
- B 46 student members
- C 57 senior citizen members
- D 89 adult members

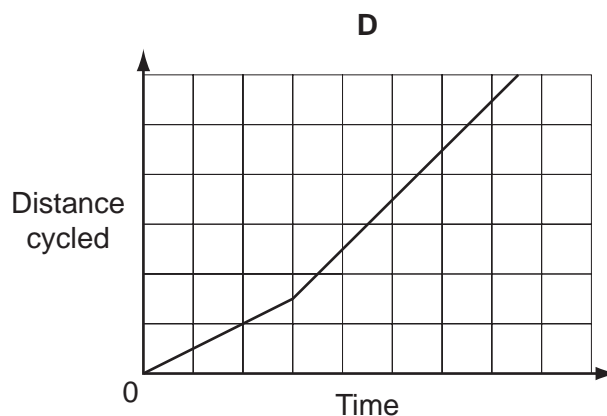
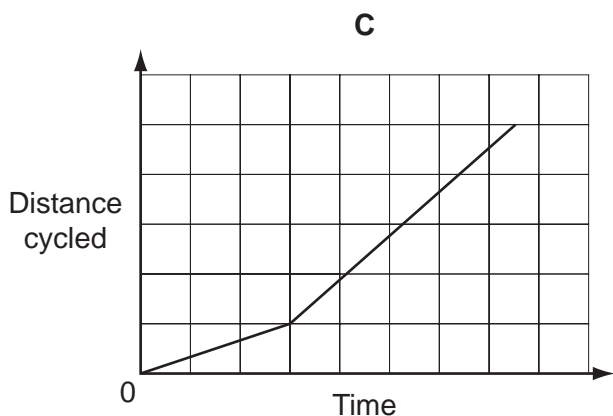
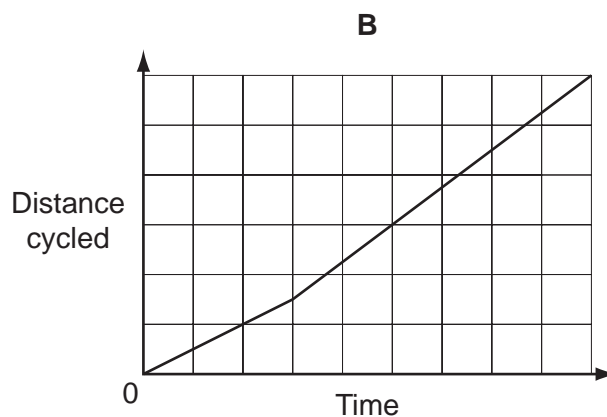
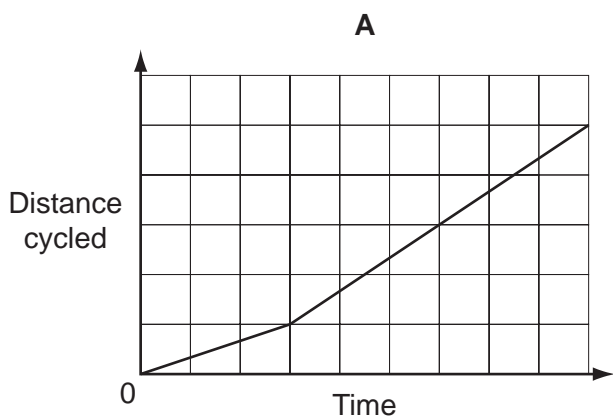
- 18 To make Todd's Punch you need 1 part cranberry juice, 2 parts pineapple juice, 4 parts orange juice, 6 parts mango juice, and 12 parts lemonade. I already have $1\frac{1}{2}$ litres of pineapple juice, 3 litres of orange juice, 9 litres of mango juice and 10 litres of lemonade. Everything is sold in 1 litre bottles.

I am having a Halloween party and would like to make Todd's Punch. I want to make sure that I use up all the ingredients that I already have.

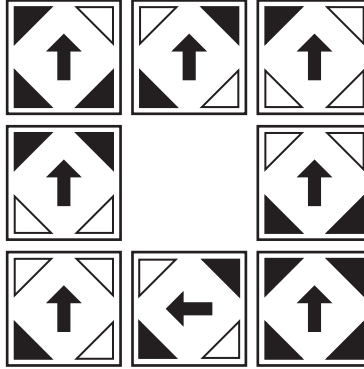
What is the minimum number of bottles that I will need to buy?

- A 14
 B 15
 C 25
 D 38
- 19 Rebecca cycles to work. The first quarter of her route is uphill, then the rest is flat. She maintains a constant speed, both uphill and on the flat, but her speed on the flat is twice her speed uphill.

Which one of the following graphs best represents Rebecca's journey to work?

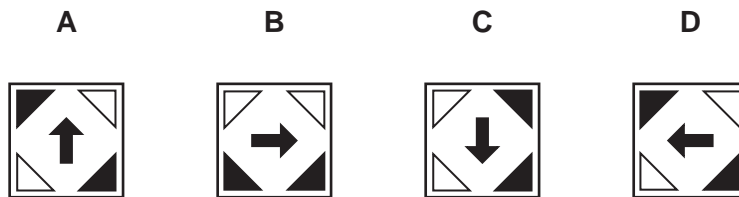


- 20 In a puzzle game a 3 x 3 grid of squares is laid out. Each corner of each square contains a triangle which is either white or black and there is an arrow at the centre of every square. On each turn a player must choose two adjacent squares and swap their positions. The squares may be turned before they are replaced in the grid. To win the game, all of the arrows must point in the same direction and wherever two squares meet the colours of the triangles must match. The current position in the game is shown below, but the middle square has not been drawn.



The game can be won on the next move.

What does the middle square look like?



- 21 Aga bought three identical plates and received change from a \$20 note. Zaina also bought three of the same plates, at the same price, and received change from a \$50 note.

Which one piece of information below would **not** enable calculation of the price of one plate?

- A The difference between the amounts of change that Aga and Zaina received
 B The total amount of change that Aga and Zaina received together
 C The sum of Aga's change and the price of one plate
 D The sum of Zaina's change and the price of one plate

- 22 A farmer has two plots of land and needs to decide which vegetables would yield the most return through the growing season. Whenever he plants a vegetable in one of his plots it occupies the whole plot. The options for which vegetables he could grow, along with their growing seasons, are shown in the table below.

	<i>Growing season</i>											
	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
Lettuce												
Tomatoes												
Potatoes												
Beans												

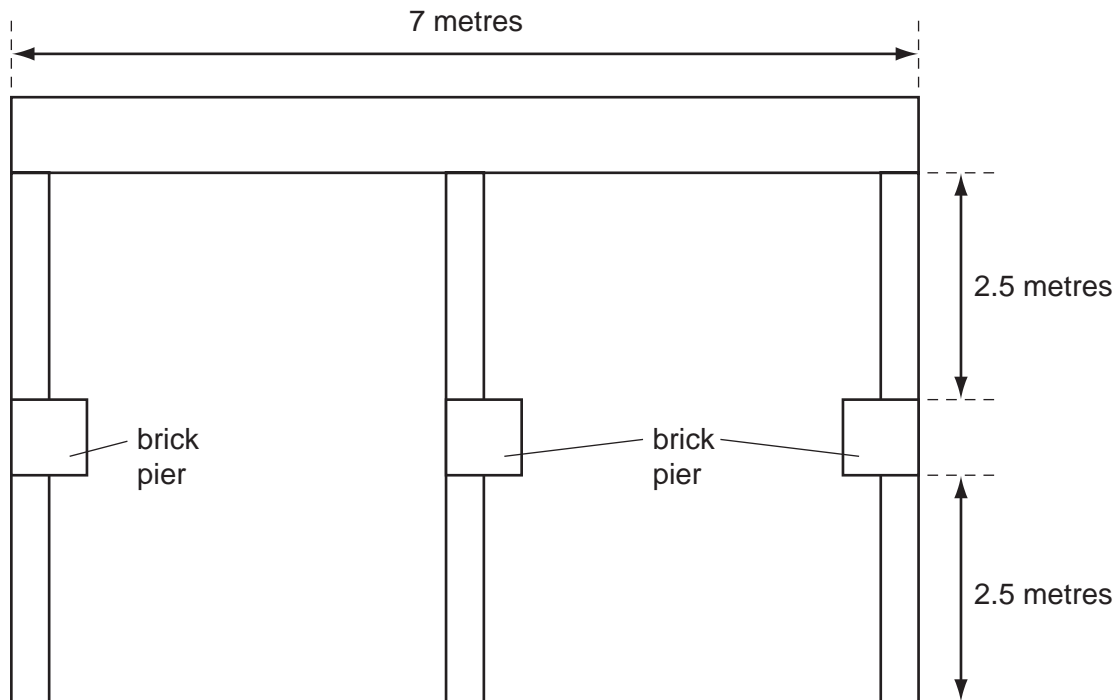
The following table shows the growing times for each vegetable along with the amount of revenue that can be derived for each crop from one plot of land. The retailer has requested at least two vegetables from the farmer.

	<i>Planting to Harvesting time</i>	<i>Yield (\$)</i>
Lettuce	2 months	200
Tomatoes	3 months	150
Potatoes	5 months	300
Beans	3 months	350

Which combination of vegetables will give the highest yield?

- A Beans, potatoes and tomatoes
- B Beans, lettuce, potatoes and tomatoes
- C Beans and lettuce
- D Beans and potatoes

- 23 A bricklayer has to build 2-metre-high walls for a new housing development to divide the back gardens. The back wall is a double-brick-wide wall, the dividers are single-brick-wide walls, and brick piers divide the three single-brick walls. A layout of the walls is given below.



A double-brick-wide wall needs 120 bricks per vertical square metre. A single-brick-wide wall needs 60 bricks per vertical square metre. Brick piers need 14 bricks per vertical metre.

How many bricks will the bricklayer need?

- A 1782 bricks
- B 2724 bricks
- C 3480 bricks
- D 3564 bricks

- 24 The table shows the first 20 finishers in a championship cross-country race.

<i>Position</i>	<i>Time</i>	<i>Name</i>	<i>Club</i>
1	00:35:11	Steve Vernon	Stockport Harriers
2	00:35:32	Michael Skinner	Blackheath Harriers
3	00:35:59	Tom Lancashire	Bolton Harriers
4	00:36:10	James Walsh	Leeds AC
5	00:36:17	Jon Pepper	Enfield AC
6	00:36:24	Bruce Raeside	Notts AC
7	00:36:25	Phil Wicks	Belgrave Harriers
8	00:36:36	Neilson Hall	Bedford AC
9	00:36:39	Ben Noad	Highgate Harriers
10	00:36:45	Paul Rodgers	Aldershot AC
11	00:36:47	Chris Smith	Thames Harriers
12	00:37:07	Dave Norman	Altrincham AC
13	00:37:09	Jonathon Gilby	Derby AC
14	00:37:10	Phil Hinch	Tipton Harriers
15	00:37:12	Andrew Wiles	New Harriers
16	00:37:19	Robbie Bugden	Bristol AC
17	00:37:20	Phil Wylie	Bristol AC
18	00:37:25	Josh Lilly	Tipton Harriers
19	00:37:29	Tom Russell	Bristol AC
20	00:37:39	Matthew Janes	Bedford AC

The club competition is decided by adding the positions of the first three runners in each club together, and the club with the lowest total wins. Only Bristol AC had three runners finishing in the top 20, but Tipton Harriers and Bedford AC both had two. All the clubs taking part entered 8 runners each in the event.

After the first 20 runners had finished, how many other clubs could potentially still win the club competition outright by getting a lower score than Bristol's total?

- A** 8
- B** 9
- C** 10
- D** 11

- 25** A train leaves the station at 13:10 and 13:40 and then every 30 minutes until 22:10. When Tom leaves work it either takes him 5 minutes or 40 minutes to reach the station, depending on whether he visits his friend on the way. Sometimes Tom gets to the station 5 minutes before a train leaves, and sometimes 20 minutes before.

Which one of the following could explain this?

- A** Tom finishes work at 16:45 every day.
 - B** Tom finishes work at 17:00 every day.
 - C** Tom finishes work at 16:45 every day, but leaves 10 minutes later if he is visiting a friend.
 - D** Tom finishes work at 17:00 every day, but leaves 5 minutes earlier if he is visiting a friend.
- 26** David is going to buy three toys to give as presents to his children. There are two toy shops in his local town and both have all three of the toys in stock. The price of each of the three toys is the same in both shops.

Each shop has a special offer:

Bill's Toy Shop: When you buy three items, the cheapest item is free.

The Toy Market: 10% off any total purchase over \$20.

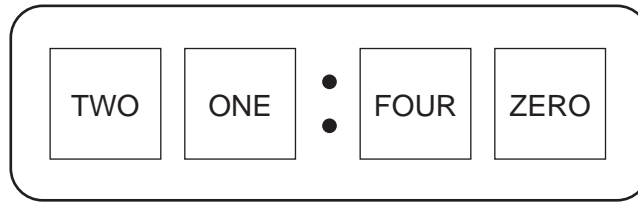
David had visited the shops last week, and had worked out that he would have to pay \$45, whichever shop he bought the toys from (after applying the relevant discount). However, when he arrived at the shops today he found that both shops had increased the prices of all three toys. The cheapest two toys have increased by \$3 each and the most expensive one has increased by \$4.

What is the difference in the total price that David would have to pay at the two stores?

- A** \$0
 - B** \$1
 - C** \$2
 - D** \$3
- 27** Ho and Kai are at opposite ends of a diameter of a circular running track. They start running at the same time in opposite directions.
- They meet for the fifth time exactly where Ho started running from. Which one of the following explains this?
- A** Ho and Kai are running at the same speed.
 - B** Ho is running twice as fast as Kai.
 - C** Kai is running twice as fast as Ho.
 - D** Kai is running three times as fast as Ho.

28 I have an unusual digital clock that displays the digits as words, not figures.

At 9.40 pm, for example, its appearance is:



How many times each day does my clock show four different words in alphabetical order from left to right?

- A 2
- B 4
- C 7
- D 10

29 The charges for the postal service are calculated by taking a fixed charge per letter or parcel and then adding a variable extra charge based on the weight.

The first 50 g is covered in the fixed charge; after this there is an extra charge for every extra 50 g (or part of 50 g). For example, a parcel weighing 130 g would be charged at the fixed rate, plus two times the extra 50 g charge.

Anything over 500 g is classified as 'bulky' and is charged a fee in addition to the ones described above.

The initial item charge is always a multiple of 10¢.

The charge per 50 g is always a multiple of 1¢.

The 'bulky item' fee is always a multiple of 15¢.

Every week I post a parcel weighing 130 g and a parcel weighing 540 g. This week some of the charges were increased (none were reduced) and my postage cost increased by 32¢.

Which of the charges must have increased to explain this increase in my postage cost?

- A The fixed charge and the charge for every 50¢
- B The fixed charge and the 'bulky item' charge
- C The charge for every 50 g and the 'bulky item' charge
- D All three charges

- 30 Alex, Brian and Charles competed in a triathlon. After the swimming and cycling, Alex started the run 15 seconds after Brian and 30 seconds after Charles. Brian ran 0.5 m/s faster than Alex.

Which one of the following additional pieces of information is sufficient to be able to work out the finishing order of the race?

- A Brian finished 10 seconds before Charles.
- B Brian finished 30 seconds before Charles.
- C Charles ran at 7.5 m/s.
- D Brian ran at 7.5 m/s.

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