THINKING SKILLS   **9694/12**

Paper 1 Problem Solving   **May/June 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 **20** printed pages.

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1   A café has the following menu:

Bacon	$1.50	Chips (per portion)	$0.40
Egg	$0.70	Baked beans	$0.50
Bacon and Egg	$2.00	Toast (per slice)	$0.25
Bacon, Sausage and Egg	$3.00	Bread and butter	$0.20
Bacon and Sausage	$2.50	Mushrooms	$0.60
Sausage	$1.20	Tea (per mug)	$1.00

Special offer!!!

FULL ENGLISH BREAKFAST
Bacon, eggs, sausage, baked beans, mushrooms and toast (2 slices) and mug of tea – **ONLY $5.00**

Three friends enter the café. Bert wants a full English breakfast, Gertie fancies bacon, egg, two slices of toast and a mug of tea and Fred orders bacon, sausage, mushrooms and baked beans. They work out the cheapest prices for each person's meal without moving food between plates.

How much would the three meals cost?

A $11.85

B $12.10

C $12.30

D $12.50

2   In a factory, 200 tin cans are produced every hour. The manager estimates that the cost of powering and maintaining the machinery is $20 for every hour. He also needs to pay the 15 employees in the factory who each earn $4 per hour. The raw materials for 50 cans cost $15.

The manager calculates the price that he sells cans for by adding all the costs together and then adding 50%.

What price should each can be sold for?

A $0.60

B $0.70

C $1.05

D $1.20

3 The ingredients written on a jar of beetroot and orange chutney are listed in order of their percentage by weight and read as follows:

Beetroot (34%), Sugar, Malt Vinegar, Oranges (14%), Onion, Apple, Modified Starch, Salt, Ginger.

Given values are rounded to the nearest 1%.

Which one of the following is the narrowest range we can put on the amount of malt vinegar?

A Between 14% and 24%

B Between 14% and 26%

C Between 24% and 34%

D Between 26% and 34%

4 My local film club conducted a survey to find out what types of film were preferred by its members. The films were grouped into five categories. The conclusion was that 75% of the members preferred either romantic or comedy films while 15% preferred science fiction. The remaining two categories had smaller numbers.

Which one of the following pie charts could **not** represent the results of the survey?

A　　　　**B**　　　　**C**　　　　**D**
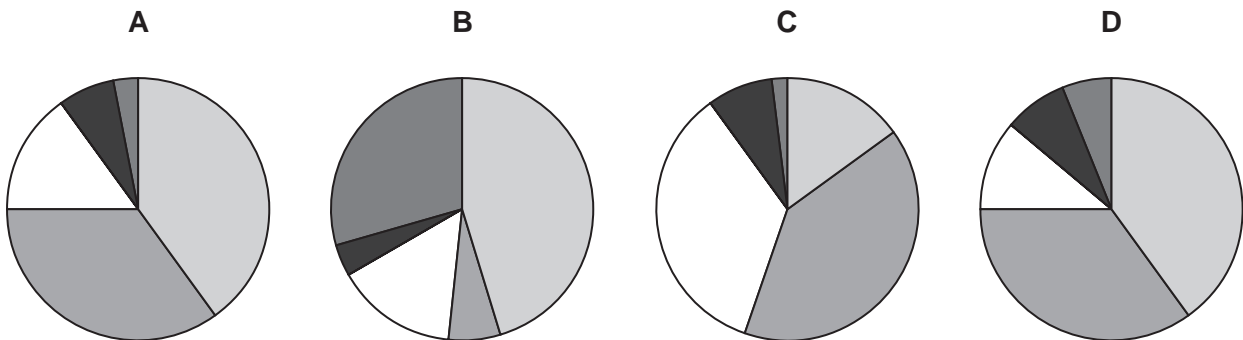
5 A large container may be filled with water from three independent sources. If just source A is used it takes 16 hours to fill the container. If used alone, source B fills the container at the rate of 25 litres per minute. Source C, if used alone, would fill the container at half the rate of source A.

Which one of the following pieces of information would **not** be sufficient to enable the time taken to fill the container using all three sources to be calculated?

A The time taken to fill the container using source B alone.

B The capacity of the container.

C The time taken to fill the container using sources A and C together.

D The rate at which source C alone would fill the container.

6 Noel wants to take his 2 children aged 6 and 4 with him on a 'Santa Special' steam train to see Father Christmas, who will give them presents (which cost $2.50 for each child). He wants to go as near to Christmas (25 December) as possible, but can only afford $20.00.

This is the list of fares for the 'Santa Special'.

| *Age in years*	*Date*							
	17 Dec	18 Dec	19 Dec	20 Dec	21 Dec	22 Dec	23 Dec	24 Dec
4 and under	$2.00	$2.50	$3.00	$3.00	$4.00	$4.50	$5.00	$4.70
5 – 7	$3.00	$3.50	$3.50	$4.00	$4.20	$5.00	$5.50	$5.20
8 – 10	$4.00	$4.50	$4.50	$5.00	$5.00	$5.00	$4.50	$4.00
10+ and adults	$5.00	$5.50	$6.00	$6.00	$6.00	$6.00	$6.00	$5.30

Which is the latest day that he can go?

A 20 December

B 21 December

C 22 December

D 24 December

7 All vehicles with a large number of seats or capable of carrying heavy loads are required to have a device installed which records how fast they travel. A paper disc rotates very slowly, and the speed is marked, with zero in the centre and the maximum speed at the edge.

Last Monday I drove on a motorway; there were no hold-ups apart from an area where there was a speed restriction for some roadworks.

Which of the following recordings would show this?

A

B

C

D
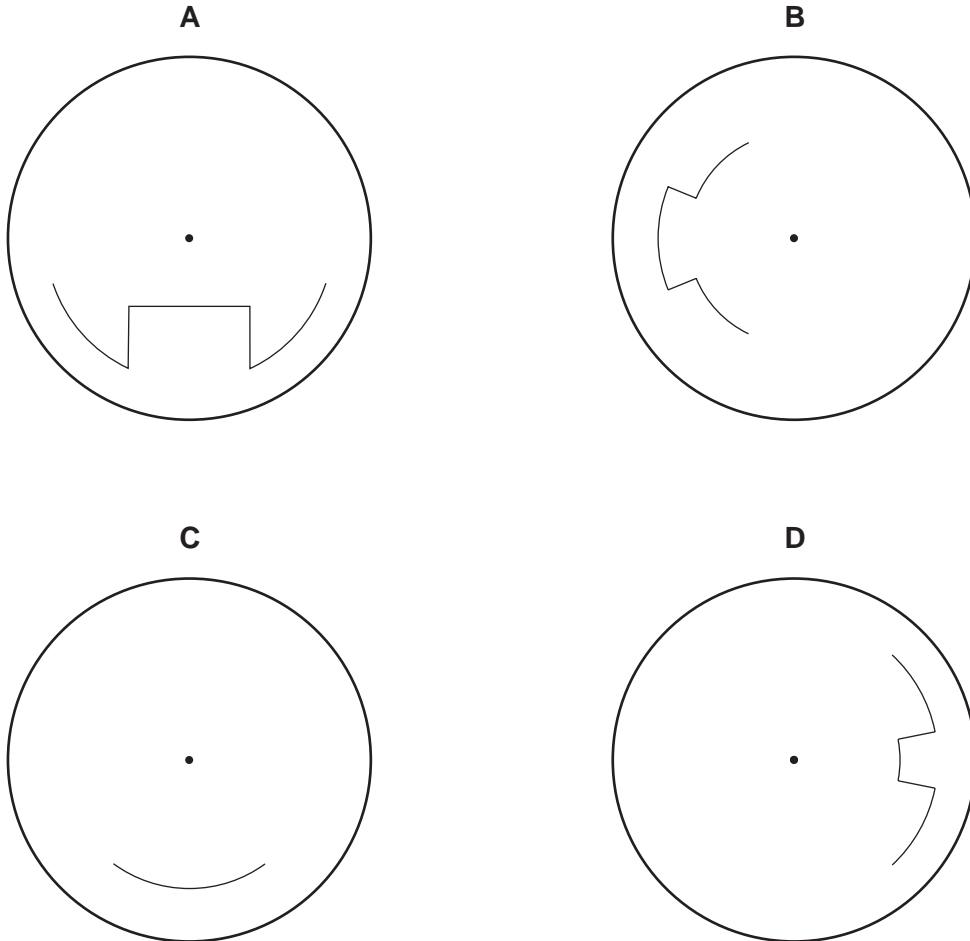
8 James has to schedule five different activities for a group of businessmen. The table shows the activities that need to happen and the restrictions that exist.

Activity	Duration	Comments
Introductory meeting	60 minutes	Must be the first activity. Starts at 09:30
Team-building	60 minutes	One of the team-building and group work sessions must be in the morning and the other one must be in the afternoon.
Group work	90 minutes	
Presentation	45 minutes	
Closing meeting	30 minutes	Must be the last activity.

There will be a 15-minute break between sessions except for lunch which has already been organised to start at 12:30 and finish at 13:30. James wants the day to finish as early as possible.

At what time will the day's activities finish?

A 15:45

B 16:00

C 16:15

D 16:30

9 The table below shows the average journey time by car, on the fastest roads, between four Italian towns.

	Arezzo	Firenze	Pisa	Siena
Arezzo	–			
Firenze	1 hr 00 min	–		
Pisa	2 hr 00 min	1 hr 05 min	–	
Siena	1 hr 15 min	1 hr 10 min	1 hr 55 min	–

Sylvia, starting from Pisa, wishes to visit Arezzo, Firenze, and Siena and return to Pisa on the same day. She wants to spend as little time in her car as possible, and chooses a route that minimises her expected time in car travel.

How long does she expect to spend travelling in her car?

A 5 hr 00 min

B 5 hr 15 min

C 5 hr 30 min

D 6 hr 05 min

10 Jessica works in an office and can work the hours that she wants. She catches a bus home which runs every 10 minutes. There is a school a five-minute walk away which is open from Monday to Friday. She wants to avoid the crush from students catching the same bus, and so she decides to watch which buses they catch from her office window. She notices that the students do not catch the bus at the same time every day.

She cannot always catch sight of the students but she records what she sees on a chart.

Day	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Monday	15:40		15:20	15:40	15:00	15:20
Tuesday	15:20	15:40		15:20		15:00
Wednesday	15:00					
Thursday	15:40	15:00	15:20	15:40	15:20	15:20
Friday	15:20	15:40	15:00	15:20	15:40	15:20

She thinks she knows what policy the school follows about letting students leave at the end of the school day. Which hypothesis fits the information?

A The school follows a 3-week timetable.

B The school works on a 3-day timetable, closing 20 minutes earlier than the previous day.

C The school follows a 5-day timetable, closing 20 minutes earlier than the previous day except on Thursday when it reverts to a later closing.

D The school follows a 6-day timetable.

11 Mark woke up in the middle of a 'focus group' session where notelets had been handed out and people had been encouraged to write issues on them. Some colleagues had already placed the gummed rectangular (but not square) notelets on a board. From where he was sitting he could only see the shape of where the notelets had been placed (shown on the diagram below), but he could tell that some were overlapping and perhaps even placed completely over others.
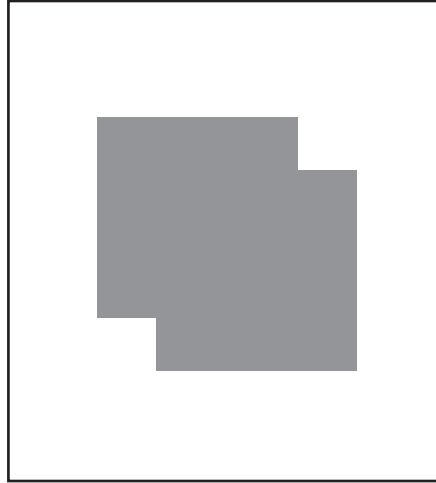
What is the smallest number of identical notelets that could have been placed on the board?

A 2

B 3

C 4

D 6

12 Clark makes frequent journeys between the towns of Axeford and Barcastle. For the journey he can choose between the bus services named Direct and Loyalty. Direct charges the same fare of $40 to all passengers at all times. Loyalty has a 'frequent user' discount system and charges $50 for the first journey a passenger takes, $49.75 for the second journey, $49.50 for the third and so on. Each journey is 25 cents cheaper than the previous one until the fare reaches $20, when there are no further reductions.

At what point would it become cheaper overall to use Loyalty rather than Direct?

A The 41st journey

B The 42nd journey

C The 81st journey

D The 82nd journey

13 My internet connection can receive data at the rate of at most 30 kB per second, but the speed at which a file can be transferred also depends on the capability of the sender's connection.

I am currently downloading two files. The smaller is 200 kB and it is showing 20% complete. The other is 220 kB and showing 50% complete. I know that the sender of the larger file is limited to 10 kB per second, but the other has plenty of capacity.

What is the minimum time from now before both files will have completed downloading?

A   8 seconds

B   9 seconds

C   11 seconds

D   16 seconds

14

Celheit Weather Station
Hours of Sunshine
June

|					
Monday 1st	7.7	Thursday 11th	9.6	Sunday 21st	7.8
Tuesday 2nd	12.4	Friday 12th	3.4	Monday 22nd	8.1
Wednesday 3rd	8.4	Saturday 13th	4.7	Tuesday 23rd	10.9
Thursday 4th	10.5	Sunday 14th	8.4	Wednesday 24th	6.7
Friday 5th	13.7	Monday 15th	8.9	Thursday 25th	8.8
Saturday 6th	8.2	Tuesday 16th	11.5	Friday 26th	6.2
Sunday 7th	10.7	Wednesday 17th	4.1	Saturday 27th	4.3
Monday 8th	9.1	Thursday 18th	6.5	Sunday 28th	7.5
Tuesday 9th	13.6	Friday 19th	5.9	Monday 29th	11.5
Wednesday 10th	8.7	Saturday 20th	6.6	Tuesday 30th	9.2

This bar chart, which has so far only been partially labelled, shows the hours of sunshine recorded at Celheit for one particular week in June.
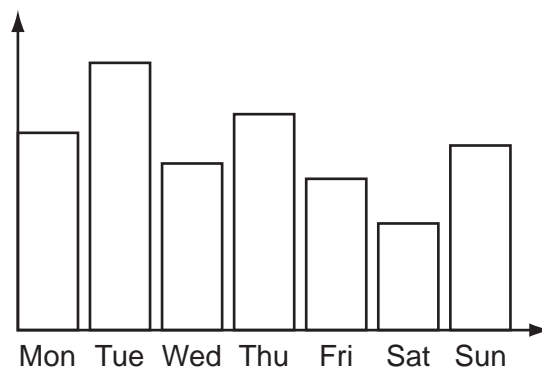
Which week's hours of sunshine does the bar chart show?

A   1st to 7th

B   8th to 14th

C   15th to 21st

D   22nd to 28th

15 The diagram shows seven tiles, patterned on one side, arranged so that wherever they touch each other the patterns match.
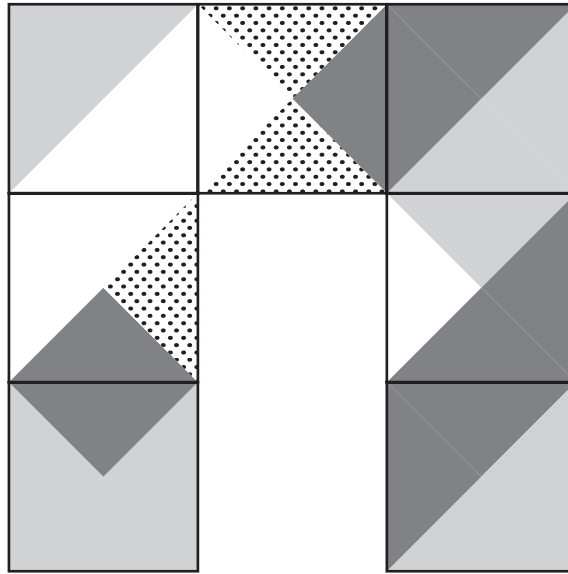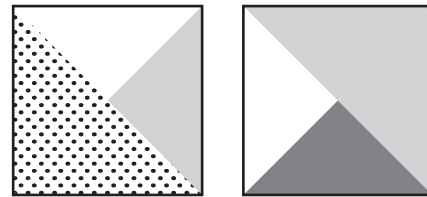

Which one of the following sets of two tiles could fill the gap and enable a three-by-three square of tiles to be completed with the matching preserved?
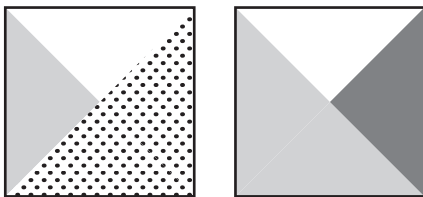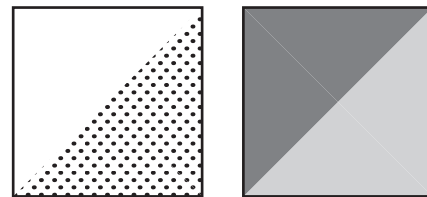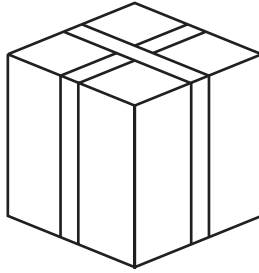
A
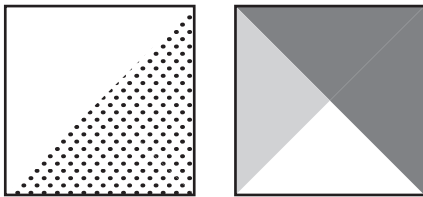
B

C

D

**16** The parcel below has a ribbon which goes round all four faces exactly in two directions to create a crossed effect. All side lengths of the parcel are equal.

Which one of the graphs below could represent the relationship between the length of ribbon used and the side length of the parcel?


A

Length of ribbon

Side length

B

Length of ribbon

Side length

C

Length of ribbon

Side length

D

Length of ribbon

Side length
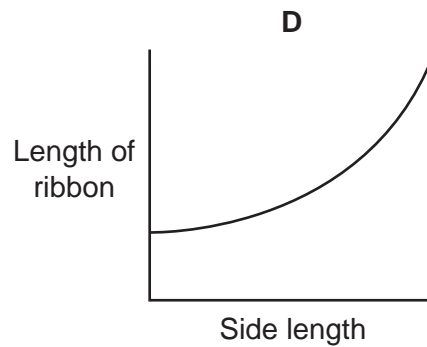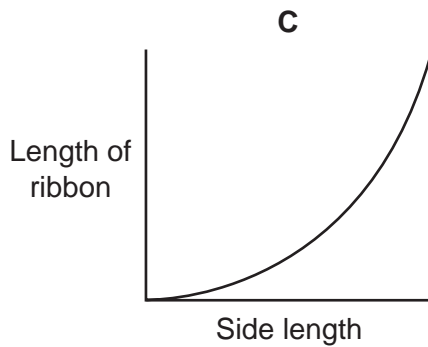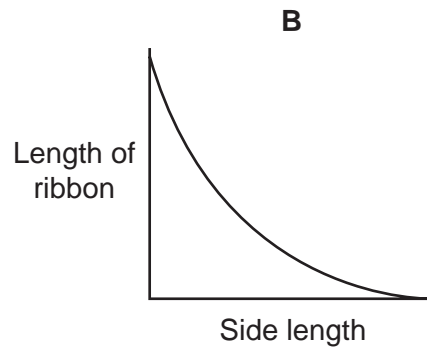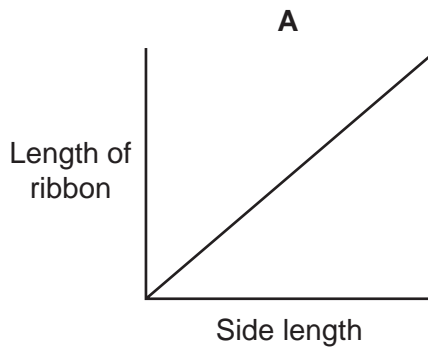
17 Yesterday I opened a savings account and paid in the $87 500 that I have recently inherited.

The account that I have chosen is aimed at savers with at least $50 000 to invest. It pays no interest for two months when the account is first opened, but from the third month interest is credited to the account as follows.

Balance before interest is added	Monthly interest
less than $50 000	0
from $50 000 to $99 999	$350
$100 000 or more	$750

My intention is to leave the money in this account without making any withdrawals for at least the next five years.

Which one of these bar charts shows the total interest I can expect to receive during each of the next five years?

A

B

C

D
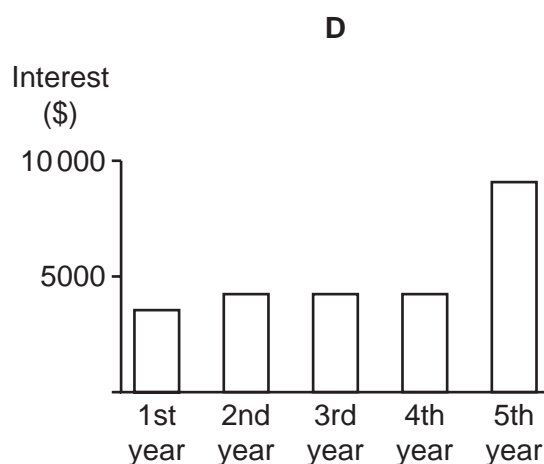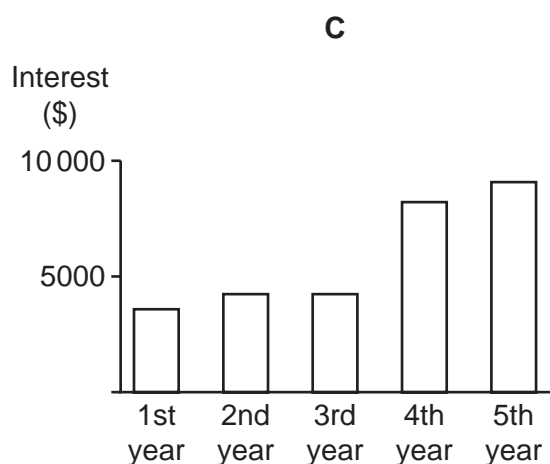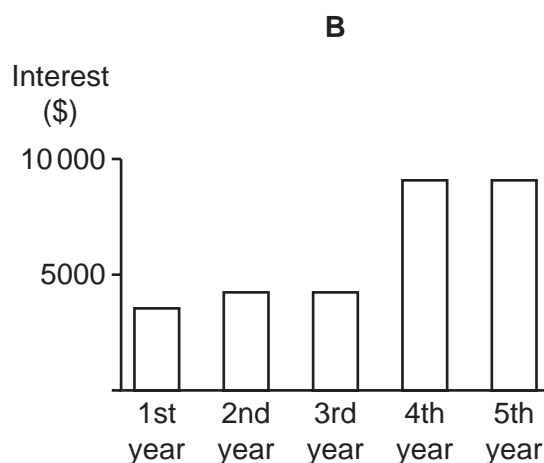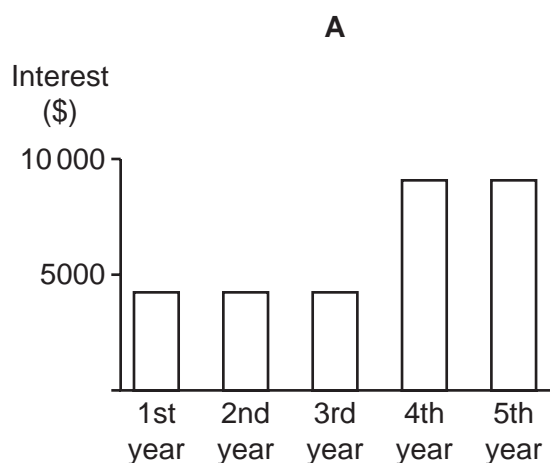
18 A detective investigating a murder is trying to pin down the time when the victim was killed in his own home.

The pathologist examined the body at 16:50 and found that the body temperature was 2.0°C below normal; bodies lose between 1°C and 1.5°C every hour. He also looked at the state of rigor mortis and decided from the degree of stiffening that death occurred between 1.5 and 2.5 hours ago. The victim had caught a train to his home at 13:45, a journey which took 45 minutes, and lived 25 minutes walk from the station. Mr Jones found the body in the victim's hallway at 15:35.

Which one of the following is a possible time that the man died, according to the evidence?

A 14:50

B 15:10

C 15:30

D 15:50

19 Daphne has been doing jobs for her parents at weekends and they have been paying her for what she does. She chose which jobs to undertake from the list below.

Job	Time taken to complete job	Payment
Washing car	1 hour 30 minutes	$6
Scrubbing kitchen floor	2 hours	$8
Supermarket shopping	3 hours	$12
Laundry	5 hours	$21
Vacuum cleaning and tidying	7 hours	$30

Daphne has been choosing which jobs to do purely on the basis of earning the most money possible. She must choose complete jobs – she cannot do part of one. In the interest of her education her parents will not allow her to work for more than eight hours any weekend.

This weekend another job is added to the list above – making breakfast for parents, taking one hour with a $4 payment.

How much **more** will Daphne earn this weekend compared to last weekend?

A $1

B $2

C $3

D $4

20 Ashley's journey to work each morning includes a 12-minute bus ride from Flinchester to Warnham station and 23 minutes aboard the train from Warnham to Pontford.

Buses from Flinchester to Warnham start from Vauton at 10, 25, 40 and 55 minutes past each hour, stopping at Flinchester 18 minutes later.

Trains for Pontford depart from Warnham every 20 minutes from 06:35 onwards.

Ashley leaves home every morning at 07:50, taking 3 minutes to reach the bus stop in Flinchester.

At what time does Ashley arrive at Pontford Station?

A 08:28

B 08:33

C 08:38

D 08:58

21 Simon and his two friends buy tickets from a low cost airline to fly to Rome. The return flight costs $10 less than the outgoing flight and the airport tax for each flight is $20 on top of the airfare. One of Simon's friends will not return and only has an outgoing ticket. The overall cost of the flights was $320.

What is the price of the outgoing flight?

A $38

B $44

C $48

D $68

22 In Vengaland the unit of currency is the wong, which is divided into 100 cents. The coinage in use is shown below together with the weights of the individual coins.

'Copper' coins (weight)	'Silver' coins (weight)	'Gold' coins (weight)
1 cent (1.5 g)	5 cent (2 g)	1 wong (10 g)
2 cent (3.0 g)	10 cent (4 g)	2 wong (16 g)
	20 cent (2 g)	
	25 cent (10 g)	
	50 cent (4 g)	

Shopkeepers are required by banks to put coins with the same weight/value ratio into bags, which can then be weighed when the money is deposited. For example, all copper coins can be put into the same bag since a 2 cent coin's weight is twice that of a 1 cent coin.

What is the smallest number of bags that a shopkeeper requires so that all his coins can be weighed when taken to the bank?

A 3

B 4

C 5

D 6

23 The cost of a mortgage (loan) for buying a house used to be very simple: a fixed cost for paperwork, a cost of a survey depending on the house value, and then a specified interest rate for an agreed number of years. There is now a bewildering range of mortgages. The variety is supposedly to cater for different markets, but makes it hard to compare the offerings of different providers.

One type provided by many companies is a discounted rate, where there is a fixed 'arrangement' fee, and then an interest rate which remains lower than the company's regular rate for a given time, but with an early-repayment charge if the loan is repaid before the end of the discount period. At the end of the discount period the rate switches to the regular rate, and there is then no repayment charge.

The Best Bolandian Bank's one-year regular (simple) rate is 3.0%, but it offers discounted rates:

Arrangement Fee	Discounted (simple) rate	Early-repayment charge
$1000	2.6%	1.00%
$2000	2.5%	1.50%

If not repaying early, what is the minimum loan for which the total cost to have the discounted rate with the higher fee is less than either the other discount or the regular rate?

A $200 000

B $250 000

C $400 000

D $1 000 000

24 An exhibit at the Emirst Art Gallery consists of 21 free-standing bricks, two of which have been painted black all over. They have been stacked into a vertical triangle, with six on the bottom row, then each successive row containing one brick fewer, tapering to one at the top. The whole exhibit is on a base that rotates continually, so that both sides are seen from the viewing position.

The Gallery has closed for the night, and the cleaner has accidentally knocked some of the bricks out of position. This is how the exhibit appears at present.

She knows that the overall shape resembles a triangle, but she can't remember where the other black brick was situated. However, she is certain that the two black bricks were **not** touching each other.

In an attempt to reconstruct the exhibit, how many distinguishably different appearances that **might** be correct has the cleaner got to choose from?

A 4

B 6

C 7

D 8

25 The four provinces that make up the Republic of Fungary (Boletus, Fuligo, Lepista and Morchella) all have their own currency at present. Next year, however, all four currencies will be replaced by a single Fungarian currency, to be known as the myco.

The relationship between the currencies has been fixed as follows.

$$1 \text{ myco} = \begin{array}{l} 1.5 \text{ Boletan ceps} \\ 3.2 \text{ Fuligan tans} \\ 0.6 \text{ Lepistan blewits} \\ 2.5 \text{ Morchellan morels} \end{array}$$

Meanwhile, in the run-up to the changeover, businesses in each of the provinces are dealing in all four currencies, at the appropriate exchange rates.

In Lepista today I paid for a DVD with a 100 morel note, and received 32 tans in change.

What was the price of the DVD in blewits?

A 18 blewits

B 30 blewits

C 45 blewits

D 50 blewits

26 Richard is buying new carpet for his office. The carpet comes in tiles which are 50 cm by 50 cm. The office is 820 cm long and 520 cm wide. Since there is no pattern on the tiles, any piece of a given size can be used and orientation is not important.

Richard wants to make sure that the whole tiles or pieces always meet in fours at their corners and that the smallest total number of pieces is used. How many tiles does Richard need to buy?

A   173

B   174

C   186

D   187

27 A bus season ticket costs $9 for 12 single trips. A standard single ticket costs $1.20 whilst a return ticket costs $1.60. A visitor to the area plans to make 7 return trips; he also plans to walk to the beach and get the bus back on 4 occasions.

What is the cost of the cheapest ticket combination he can purchase?

A $13.80

B $15.40

C $16.00

D $16.20

28 The company that cleans the offices at work calculates the amount that it charges from the number of rooms that are cleaned. The rooms are classified as one of three sizes (small, medium and large) and there is a different price (which is a whole number of ¢) for each size. There are 30 rooms to be cleaned. The total charge for the cleaning has just been increased by $12 per night. The company previously charged 80¢ for small rooms, $1.20 for medium rooms and $2 for large rooms. The rooms to be cleaned have not changed.

Which one of the following **could** explain the $12 increase in the price?

A   10 medium rooms have been reclassified as large rooms, but the prices have not changed.

B   10 medium rooms have been reclassified as large rooms and the price to clean a large room has increased by 20¢.

C   20 small rooms have been reclassified as medium rooms, but the prices have not changed.

D   20 small rooms have been reclassified as medium rooms and the price to clean a small room has increased by 20¢.

29 On my way to work this morning I walked with my friend for the first 1/4 of the distance, at which point he had reached his work. I looked at my watch and realised that I had been walking at 2/3 of my normal pace and so I would have to walk more quickly to get to work at my normal time. I normally arrive at work 5 minutes early, so I was still able to get to work exactly on time by walking at my normal pace for the remaining 3/4 of the journey.

How long does it normally take me to walk to work?

A 20 minutes

B 30 minutes

C 40 minutes

D 60 minutes

30 A family kept a record of the prices it paid for, the quantities it bought of, and its expenditure on foodstuffs in March 2009. The record is in the table below.

MARCH 2009	Price per kg ($)	Quantity (kg)	Expenditure ($)
Meat	10.50	11.50	120.75
Fish	13.25	2.05	27.16
Fruit	2.10	15.00	31.50
Vegetables	1.12	42.00	47.04
Total			226.45

The family, subsequently, partly in response to the price of meat rising much more than the prices of some other foods and partly for ethical reasons, stopped eating meat. Its expenditures on foodstuffs in March 2010 are given below.

MARCH 2010	Price per kg ($)	Quantity (kg)	Expenditure ($)
Meat			0
Fish			56.20
Fruit			42.80
Vegetables			61.25
Total			160.25

The family wishes to know what its total expenditure in March 2010 would have been had it kept to the same diet as in March 2009.

To make this calculation, which one of the following is correct?

A A record of the prices of the various foodstuffs in 2010 alone is sufficient to make this calculation, but a record of the quantities bought in 2010 alone is not sufficient.

B A record of the quantities bought of the various foodstuffs in 2010 alone is sufficient to make this calculation, but a record of the prices in 2010 alone is not sufficient.

C Together both a record of the prices of the various foodstuffs and the quantities bought in 2010 is sufficient to make this calculation, but neither record is sufficient by itself.

D Either a record of the prices or the quantities in 2010 is sufficient to make the calculation.