

THINKING SKILLS

9694/13

Paper 1 Problem Solving

May/June 2015

1 hour 45 minutes

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

* 5 5 3 3 2 5 8 7 0 6 7 *

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

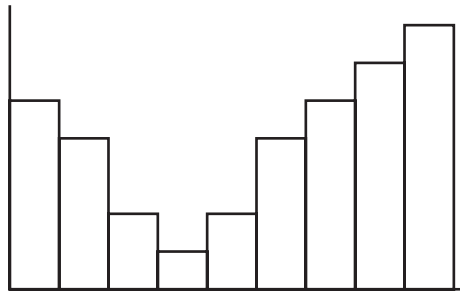
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

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

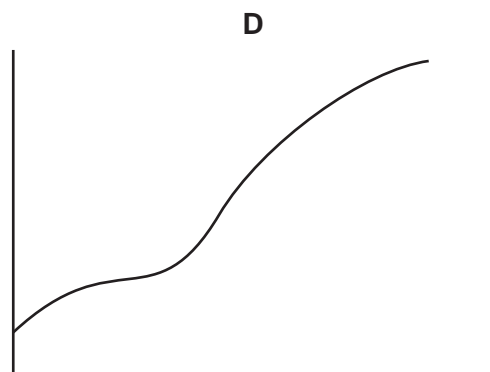
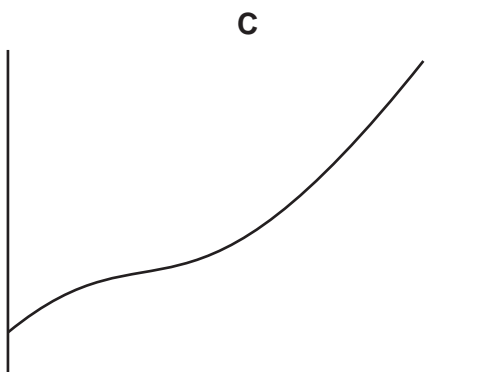
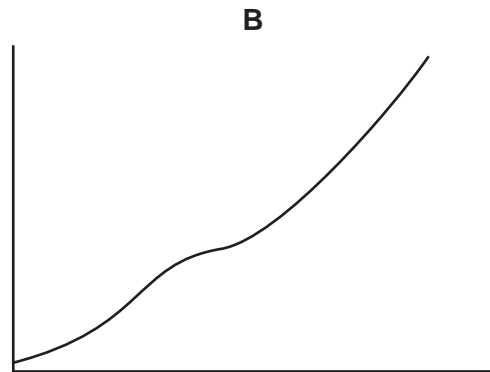
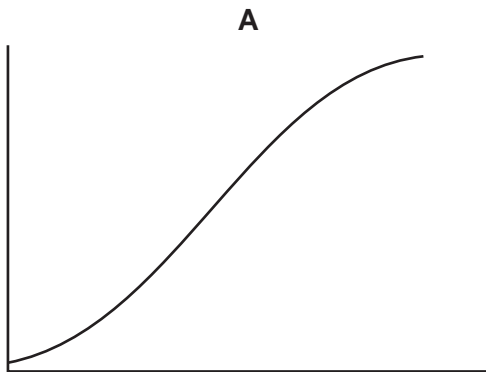
- 1 John feeds the wild birds in his garden with bird seed placed in three feeders. Two of these containers have the same capacity, each holding 300 grams of seed, whilst the third feeder holds 900 grams of seed. His seed storage bin contains 18 kilograms of seed. Because more birds can visit the large container, it takes the same amount of time to become empty as the smaller ones, and all three containers have to be refilled every second day.

How many days will he be able to feed the birds for?

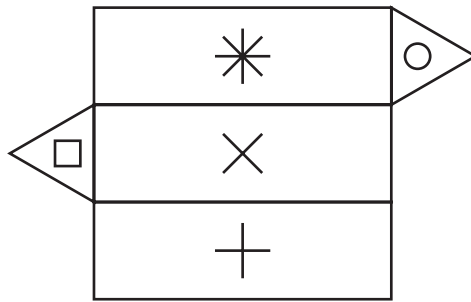
- A 20 days
 B 23 days
 C 24 days
 D 30 days
- 2 Last year James saved up to buy a car. The following diagram is a graph of the amount of money that he added to his savings each month over a nine-month period.



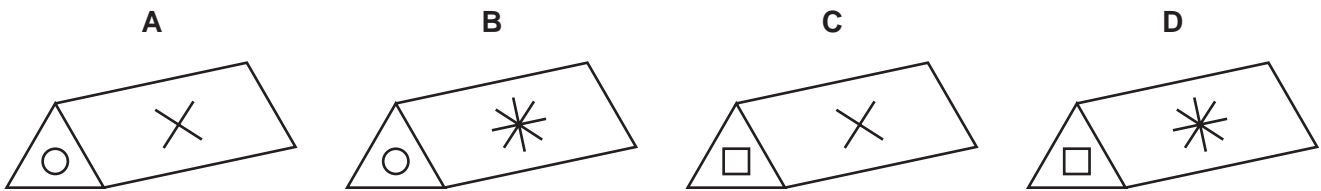
Which of the following graphs, if suitably labelled, shows the growth of James's total savings over the same period of time?



3 This is the net of a triangular prism.



Which one of the following is **not** a view of the prism?



4 Elvis wishes to emigrate and has done some research. He wants to move to a country which matches at least four of the following five criteria: male long-term unemployment is below 1.5%; GDP is between \$15 000 and \$30 000; car mortality is below 5 in every 100 000; annual oil consumption is less than two tonnes per capita; and the urban population is below 80%.

	GDP (\$)	Male long-term unemployment (%)	Oil Consumption per capita (tonnes per year)	Urban population (% of total)	Car mortality per 100 000
<i>Australia</i>	24 765.55	0.71	1.98	88.53	5.34
<i>Denmark</i>	32 767.40	0.62	1.70	86.23	2.33
<i>Greece</i>	14 801.55	2.13	1.93	60.68	11.20
<i>Mexico</i>	6 333.08	0.16	0.82	76.91	9.47
<i>Poland</i>	5 932.47	4.18	0.63	61.25	7.52
<i>Spain</i>	16 351.11	1.39	1.77	76.93	7.10
<i>United Kingdom</i>	29 771.30	1.62	1.30	79.21	3.38
<i>United States</i>	38 710.89	0.50	3.12	81.30	5.46

Which two countries should he consider moving to?

- A Australia and Denmark
- B Denmark and Spain
- C Spain and United Kingdom
- D United Kingdom and United States

- 5 Three friends are travelling by aeroplane and want to pay as little as possible in total for their luggage.

The airline rules are:

Every passenger may carry 10 kg of luggage for free.

Every extra 1 kg above this costs \$5.

The maximum amount of luggage any one passenger may carry is 20 kg.

In total, the three friends are carrying four items weighing 6 kg, 7 kg, 9 kg and 12 kg. Anyone may carry any item of luggage.

What is the least total cost for their luggage?

- A \$20
 - B \$25
 - C \$30
 - D \$35
- 6 William buys a bus ticket every day, Monday to Friday, for \$2.50. The bus company has just introduced a card which can be bought to get a discount on all bus fares. Each card is valid for 4 weeks. William has worked out that he will pay exactly the same amount if he gets the card as he will if he continues to buy tickets at the normal price.

Which of the following could be the price and discount for the card?

- A \$5 for the card and a discount of 10% on ticket prices
- B \$5 for the card and a discount of 50% on ticket prices
- C \$10 for the card and a discount of 50% on ticket prices
- D \$10 for the card and a discount of 80% on ticket prices

7 Sealand Books currently has the following offer.

3 FOR THE PRICE OF 2

Buy 2 books and get 1 free

(the lowest-priced book of the three is free)

The following books are available:

The Michaelangelo Cypher \$7.49	Moondance \$8.49	The Green Lion \$6.99
Revenge \$6.49	Maze \$7.99	Dr. Odd \$5.99
Major Dante's Cello \$5.49	The Crystal Mansion \$8.99	Barbados Hotel \$9.49

I have only \$15 to spend and I want to make the most of the offer by buying the greatest value of three different books for my money.

Which one of the following will be included in my selection?

- A** Dr. Odd
- B** Maze
- C** Moondance
- D** The Michaelangelo Cypher

8 Amelia is running around a circular 6 km loop. Her friend Boris is injured, so is not going to run the full distance. At the same time and place that Amelia starts, Boris sets out in the opposite direction around the loop, walking at half her running speed. When they meet, Boris turns around and returns to the beginning with Amelia, running at her pace.

How far did Boris **run**?

- A** 1.5 km
- B** 2.0 km
- C** 3.0 km
- D** 4.0 km

- 9 Colin is an air steward. His plane has just landed at Gallinazo airport at 22:17 (local time) after flying to Ortolan, where the local time is 3 hours ahead of Gallinazo, and back. The total flying time was 12 hours 38 minutes, and the plane departed from Ortolan 1 hour 45 minutes after its arrival.

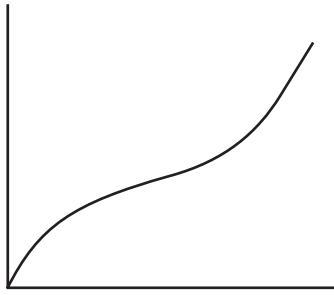
Which one of the pieces of information given above is **not** needed to work out the (local) time at which Colin took off from Gallinazo earlier today?

- A Landing time at Gallinazo was 22:17
 - B Ortolan's local time is 3 hours ahead of Gallinazo
 - C The plane departed from Ortolan 1 hour 45 minutes after its arrival
 - D Total flying time was 12 hours 38 minutes
- 10 My cookbook says that a salad sauce should be made of $\frac{1}{3}$ lemon juice and $\frac{2}{3}$ oil. I put in 50 ml oil but my hand slipped when adding the lemon juice and the total volume is now 90 ml.

How much oil must I add to have the correct proportions?

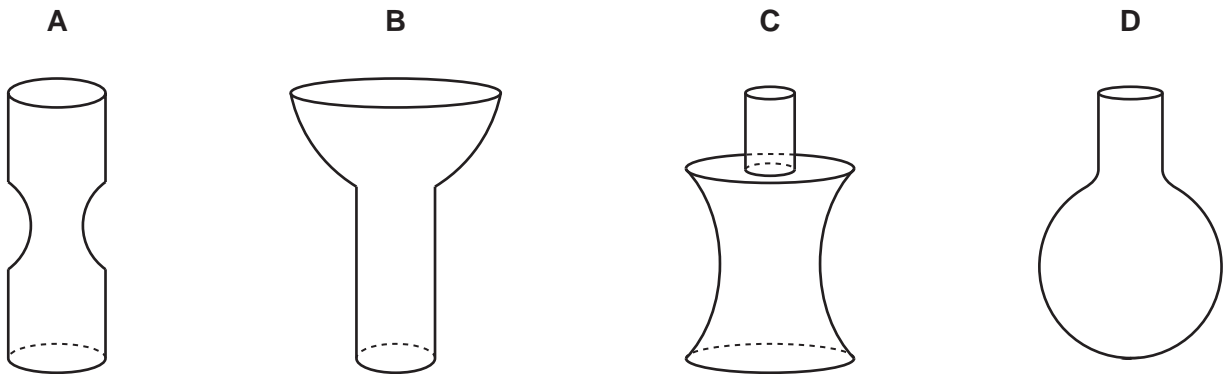
- A 10 ml
- B 30 ml
- C 40 ml
- D 80 ml

- 11 Water is allowed to flow at a constant rate into a glass vessel. This graph shows the height that the water has reached in the vessel over time.



Cynthia looks at the graph and amuses herself by drawing the following 4 sketches of what she thinks the glass vessel might look like in reality.

Which one of Cynthia's 4 sketches was closest to what the glass vessel looked like in reality?



- 12 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

- 13 A boxer must burn at least 1000 calories each day in training. Below is a timetable for Monday to Wednesday for Rhod the Boxer.

	Swim	Run	Spar	Skip	Gym
Calories used	700	550	600	450	500
Monday	✓		✓		
Tuesday		✓			✓
Wednesday	✓			✓	
Thursday					
Friday					

Rhod completes two exercises each day. He never does an exercise more than twice in a week.

How many ways can the timetable be completed?

- A** 4
B 6
C 8
D 12
- 14 As part of national celebrations, the town's head gardener has been instructed to create a representation of the national flag using flowering plants to provide the colours. The ratio of the colours needed is 6 Red : 5 White : 4 Blue.

There will be 60 rows of 100 plants. In order to make sure that there are replacements for any plants that die, an extra 10% of each colour will be grown.

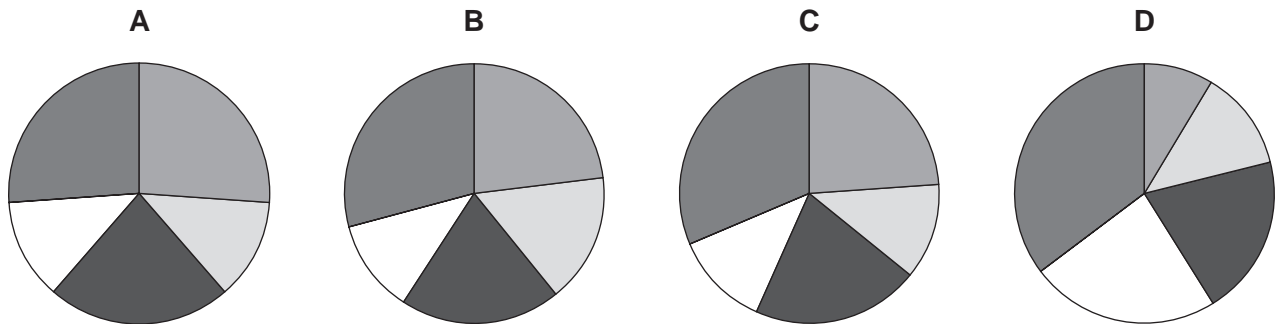
How many red plants in total will need to be grown?

- A** 2160
B 2400
C 2640
D 3000

- 15 At the beginning of January, Jimmy started to save up for a new racing cycle. At the end of each month he put his savings into a bank account from which he made no withdrawals before June. The total amount that he had in his bank account at the end of each month up to May is given in the following table.

<i>Month</i>	<i>Total savings</i>
January	\$98
February	\$146
March	\$232
April	\$280
May	\$410

Which of the following pie charts, if suitably labelled, would represent the amount Jimmy put into the bank account each month?



- 16 A motor garage undertakes between 100 and 120 car services every 3 months. As part of the service the engine oil is completely replaced. The cars which are serviced have an engine oil capacity of between 4 and 6 litres.

At the end of every 3-month period, the garage's oil tank must be emptied and cleaned, with any surplus oil being wasted. However, the garage must buy enough oil to ensure they do not run out.

The oil is purchased from one supplier only. The prices for four possible suppliers are shown below.

Which supplier will be the cheapest for the garage to use?

- A Wholesale Oils: 10 litres for \$16
- B Gasoil Ltd.: 20 litres for \$38
- C All Oils: 80 litres for \$163
- D Car Lubricants: 200 litres for \$300

- 17 Eleven students have to decide who should get the award of “tutor of the year”. There are 3 candidates for the award, Paris, Arthur and Monica. Each student has secretly ranked these three in order. The preferences for each student are given in the table below.

<i>Student</i>	<i>First choice</i>	<i>Second choice</i>	<i>Third choice</i>
1	Paris	Arthur	Monica
2	Paris	Arthur	Monica
3	Paris	Arthur	Monica
4	Paris	Monica	Arthur
5	Monica	Arthur	Paris
6	Monica	Arthur	Paris
7	Monica	Arthur	Paris
8	Monica	Paris	Arthur
9	Arthur	Monica	Paris
10	Arthur	Monica	Paris
11	Arthur	Paris	Monica

There are two proposals about how these rankings should be used to determine the award winner.

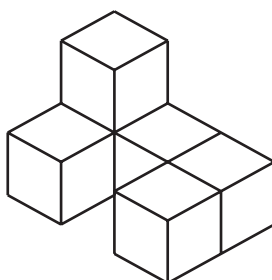
Proposal 1 is that the tutor with the fewest first choices should be eliminated. Then the second choices of the students who chose this tutor as their first choice should be added to the first choices of the other two tutors. Whoever now has the most first choices gets the award.

Proposal 2 is that there should be three comparisons made: Arthur against Monica, Arthur against Paris, and Monica against Paris. Each comparison is won by the tutor who was ranked higher by more students. If a tutor wins both of his/her comparisons he/she should get the award. If no tutor wins both comparisons, no award will be made.

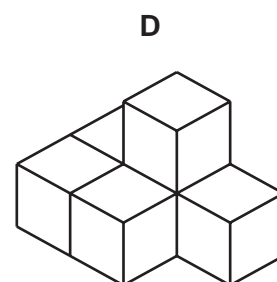
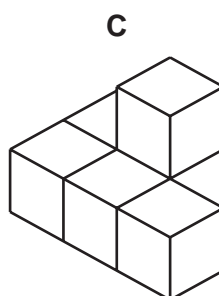
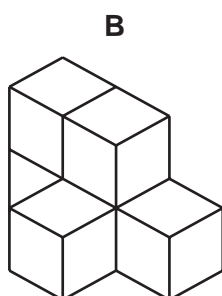
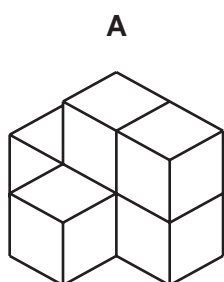
With the rankings in the table above, who would get the award under proposal 1 and under proposal 2?

- A** Proposal 1: Monica Proposal 2: Arthur
B Proposal 1: Monica Proposal 2: Monica
C Proposal 1: Paris Proposal 2: Arthur
D Proposal 1: Paris Proposal 2: Paris

- 18 A hexacube is made from six cubes glued together face to face. One hexacube is shown below.



Which one of the hexacubes below will fit with the one above exactly to make a cuboid?



- 19 Colin likes to support local artists, but also likes to think he can pick artists whose work will increase in value. He has up to \$8000 to spend on paintings and is limiting his choice to the paintings in the table below. The table gives the price he would have to pay for the painting, and the amount Colin thinks its value will increase by before his planned sale of paintings in three years' time. He will buy paintings so as to make his expected increase in value as large as possible.

<i>Title</i>	<i>Artist</i>	<i>Price (\$)</i>	<i>Expected increase in value (\$)</i>
Artichokes	Alban Ache	1000	500
Blue Boil	Betty Blue	1500	700
Calm Chaos	Curly Collar	2500	1000
Dirt on Dog	Deidre Den	3000	1400
Eels	Edna Elastic	4000	2100
Foolsmate	Fiona Fresh	5000	2400

By how much in total does Colin think that the paintings he intends to buy will increase in value?

- A** \$3800
B \$3900
C \$4000
D \$4200

- 20 “Leave It To Us” is a company that organizes children’s parties. They charge a basic price of \$24, plus additional charges per hour of the party and per child attending.

I hired the company last year for my daughter’s birthday. The party was a great success, so I have hired them again this year.

Last year the party lasted for 3 hours and 15 children were present. The total cost was \$120. This year the party will last for 4 hours, but there will only be 12 children. “Leave It To Us” has not changed any of the charges since last year, and the total cost will again be \$120.

What is the scale of charges employed by “Leave It To Us”?

- A \$24 + \$12 per hour + \$4 per child
 - B \$24 + \$15 per hour + \$5 per child
 - C \$24 + \$17 per hour + \$3 per child
 - D \$24 + \$18 per hour + \$2 per child
- 21 Charlie’s car uses 1 litre of fuel for every 10 km that it travels. The fuel tank holds 50 litres and Charlie never lets the amount of fuel in the tank fall below 10 litres. At the moment there are 30 litres of fuel in the tank.

He is about to embark upon a long journey of 800 km to Bugu and there are only a few stations where he can buy fuel on the way. The first is 100 km from the start of the journey with fuel at \$1.50 per litre. Then there is another station, 200 km further on where fuel is \$1.00 per litre and then in a further 200 km a station with fuel at \$2.00 per litre. There are no more stations before Bugu, where fuel can readily be bought.

What is the least Charlie must spend on fuel before he reaches Bugu?

- A \$50
- B \$55
- C \$75
- D \$85

22 This is the squad that will represent Habitalia at this year's Swingball World Cup:

<i>Name</i>	<i>Date of Birth</i>
Buddy Aviary	21/10/1984
Jack Burrow	07/01/1978
Leo Den	18/02/1979
Cyril Drey	26/04/1981
Ed Eyrie	04/09/1987
Harry Form	17/06/1982
Archie Hive	07/01/1985
Otto Holt	24/12/1980
Todd Lair	04/09/1982
Caspar Lodge	21/08/1976
Robin Nest	13/09/1981
Melvin Sett	24/11/1986
Greg Stable	30/11/1989
Peter Warren	19/10/1987

Clearly two pairs of squad members share the same birthdays (Burrow and Hive – 7th January, and Eyrie and Lair – 4th September). Less obvious, however, is the fact that two pairs have dates of birth that are numerical anagrams of each other (the same digits in a different order).

Nest and Stable form one of these pairs. Which two squad members make up the other pair?

- A Aviary and Holt
- B Den and Warren
- C Drey and Sett
- D Form and Lodge

23 Jenny invited 17 guests to a party. She gave each guest a number from 2 to 18, keeping the number 1 for herself. She then challenged her guests to pair everyone such that the sum of each pair's numbers was a perfect square, i.e. 4, 9, 16 or 25.

What was the number of Jenny's partner?

- A 3
- B 8
- C 15
- D 17

- 24** There are 20 students taking an examination. The exam paper is divided into Section A and Section B and there are three questions in each section. Students are required to answer 3 questions in total, with at least one question from each section. The examiner knows that different questions will take different times to mark. Her estimates of the time each question takes to mark are given below.

Section A Question 1	5 minutes
Section A Question 2	10 minutes
Section A Question 3	15 minutes
Section B Question 4	10 minutes
Section B Question 5	15 minutes
Section B Question 6	20 minutes

The examiner knows the students well, and is confident that no more than 10 will attempt Question 3 and no more than 5 will attempt Question 6, but at least 15 will attempt Question 4. The examiner wishes to make sure that she sets aside enough time to make sure she can complete the marking.

How much time should the examiner leave free for marking?

- A** 10 hours
 - B** 10 hours 50 minutes
 - C** 13 hours 20 minutes
 - D** 16 hours 40 minutes
- 25** In the student canteen the breakfast menu lists the prices of an egg, a rasher of bacon, a sausage, a portion of mushrooms, a pot of tea, and a pot of coffee. You choose which and how many of these you want.

Joe chose two eggs, two rashers of bacon, one sausage, a portion of mushrooms and a pot of coffee. It cost him \$5.00.

Mary chose one egg, one rasher of bacon, one sausage, and a pot of coffee. It cost her \$3.25.

Bill chose two eggs, two rashers of bacon, two portions of mushrooms and a pot of coffee.

Which one of the following pieces of information would be sufficient to calculate the cost of Bill's breakfast?

- A** The price of an egg
- B** The price of a rasher of bacon
- C** The price of a portion of mushrooms
- D** The price of a pot of coffee

- 26** I have two nephews and one niece who will visit me this afternoon. I have decided to give them each some money to buy some sweets on the way home. I cannot give them the money and ask them to share it because they will argue, so I need to make sure that I give them each exactly the same amount of money. The money that I have is a combination of 20¢, 50¢ and \$1 coins and totals \$7.50. Unfortunately, I cannot split this into three sets of \$2.50 because of the numbers of each type of coin.

What is the largest possible amount that I could give to each of the children if I make sure that they each receive the same in total?

- A** \$2.00
B \$2.20
C \$2.30
D \$2.40
- 27** When my mobile phone is not being used it displays the time and the date. Shortly after I bought it, I noticed this display with nine different digits visible.



It set me wondering when I could expect to see all ten different digits simultaneously. I was surprised to discover that this will not occur until June 2034.

When all ten different digits eventually do become visible simultaneously on this phone for the first time, what time of day will it be?

- A** Between 00:00 and 06:00
B Between 06:00 and 12:00
C Between 12:00 and 18:00
D Between 18:00 and 00:00

- 28 In a galaxy quite far away there live people who do not use numbers to display the time – they use letters instead. They have a 60-minute hour and a 24-hour day, just like us.

They use the letters *a* to *l* to represent the numbers 1 to 12.

The time is displayed using two 3-letter combinations: the first for the hours and the second for the minutes.

Each 3-letter combination must be in alphabetical order.

The hours or minutes are found by multiplying the values of their three letters together.

For example, 08:55 might be written as *aah:aej* or *bbb:aej*.

There are obvious limitations to this system, such as the inability to express 17 minutes past any hour. However, it is the preferred method of telling the time.

How many different ways of writing 12:24 are there in this system?

- A 2
- B 20
- C 486
- D 720

- 29 Byron, Jane, Katriona and Ron went to Delhi. Between them they had \$700, in the proportions shown in Fig. 1.

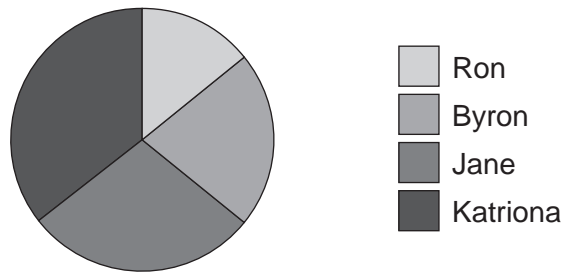


Fig. 1

Fig. 2 shows the proportions at some later time.

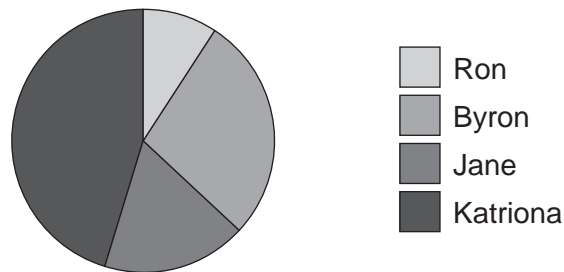


Fig. 2

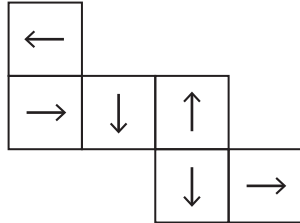
Which of the following best describes the single event that happened between the first and second chart?

- A Jane and Ron each lost half of their money
- B Ron and Byron changed their money at the airport at a rate of 90 rupees per dollar while Jane and Katriona changed theirs in Delhi at a rate of 110 rupees
- C They each paid a \$5 commission charge and received an exchange rate of 100 rupees per dollar
- D Ron received \$70 from Byron, Jane and Katriona to cover a hotel room he paid for before they left

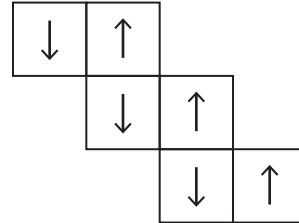
- 30 Jonathan wants to design a die for a game. Each face of the die must contain an arrow pointing to one of the edges. No edge of the die can have more than one arrow pointing towards it.

Which of the following nets would be suitable to create the die?

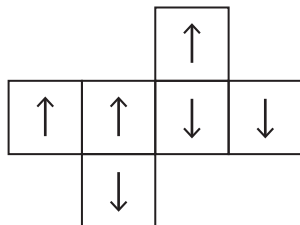
A



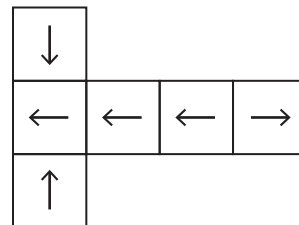
B



C



D



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