



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

THINKING SKILLS

9694/13

Paper 1 Problem Solving

October/November 2013

1 hour 30 minutes

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

* 8 2 2 3 7 3 3 4 5 8 *

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



- 1 A group of 25 students were each asked how many brothers and sisters they had. The table below shows the results.

		Number of sisters			
		0	1	2	3
Number of brothers	0	1	2	3	1
	1	4	2	2	1
	2	2	3	0	1
	3	1	1	0	1

How many students have more sisters than brothers?

- A** 10
B 11
C 14
D 15
- 2 Al Erton plays basketball for the Bolandian Legends. Last night, in his 16th game of the season, he scored 46 points, beating his previous best during this season by 12 points and increasing his season's average of points per game by 1.55.

In order to calculate the total number of points scored by Al so far this season, which one of the figures in the information given would **not** be needed?

- A** 1.55
B 12
C 16
D 46
- 3 Mary visited a local graveyard and recorded both the age and the year when people died.

Master Black died aged 7 years in 1905
 Mrs Green died in 1948 aged 49 years
 Miss White died aged 38 years in 1936
 Mr Brown died in 1931 aged 35 years

Who was born first?

- A** Master Black
B Mrs Green
C Miss White
D Mr Brown

- 4 To mark the 50th anniversary of Webberliss Rugby Club, the committee bought 80 customised mugs and 80 customised key rings at a total cost of \$525. Hoping to make a profit, for club funds, it was decided to sell the mugs at \$9 each and the key rings at \$3 each.

The key rings were popular and soon sold out. However, by the end of the anniversary year, only 27 mugs had been sold, and none has been sold since.

It has now been decided to offer the remaining mugs for sale at \$2 each, in the hope that the money spent on the customised items can be recovered.

How many more mugs need to be sold now for the club to recover the money they originally spent?

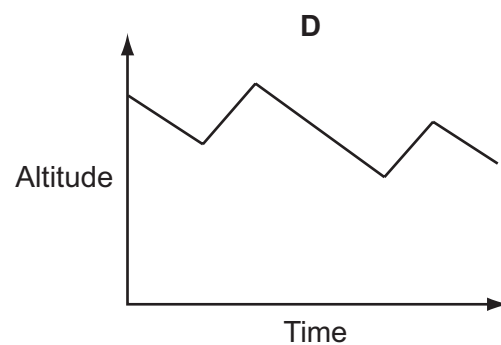
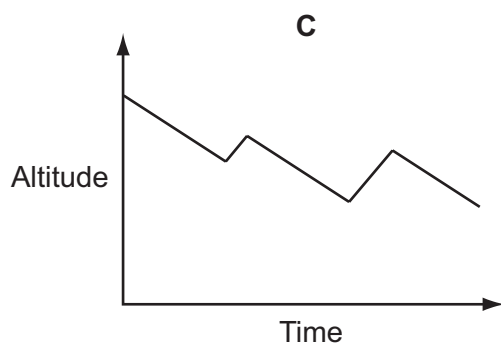
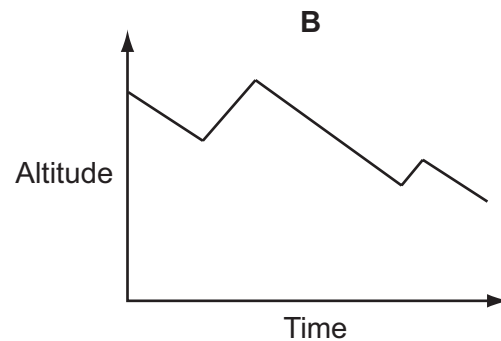
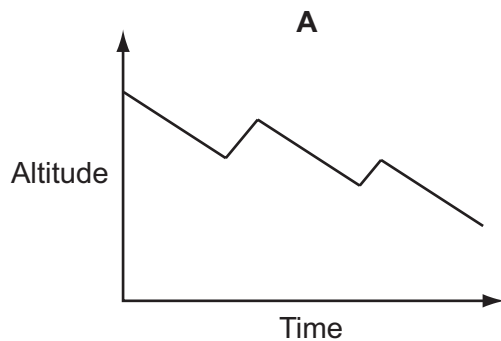
- A 5
- B 14
- C 21
- D 42

- 5 Gliders are aeroplanes without engines which are flown by enthusiasts. The gliders are taken up into the sky by a motorised plane, then released and allowed to glide down to the ground. To rise in altitude, and therefore stay in the air longer, pilots look for thermals (which are columns of rising air).

A glider is taken to a height of 2000 m by an aeroplane. When gliding, it loses height at a rate of 50 m per minute. When in a thermal it rises at a rate of 100 m per minute.

After being released by the aeroplane, the pilot glides for 10 minutes, then encounters a thermal which causes him to rise for 3 minutes. He glides down for a further 12 minutes, then meets a second thermal which allows him to rise for 2 minutes, after which he glides down to the ground.

Which one of the following graphs best represents his altitude as a function of time?



- 6 23 teams have entered this year's Morbesh Netball Tournament. They have been divided into 3 groups of 6 and 1 group of 5. Within each group the teams will all play each other once.

The winner of each group will qualify for the final pool, together with one of the runners-up. To win this place in the final pool, the 4 runners-up will compete in a knockout (2 semi-finals and a final). The 5 teams in the final pool will then all play each other once, which will decide the overall winner.

What is the greatest number of matches that a team could have to play in this year's Morbesh Netball Tournament?

- A** 11
B 12
C 13
D 14

- 7 A designer is commissioned to produce a carton which will hold at least 1 litre (1000 cm^3) of liquid. The carton must have a square base, be twice as tall as it is wide, and all dimensions must be a whole number of centimetres.

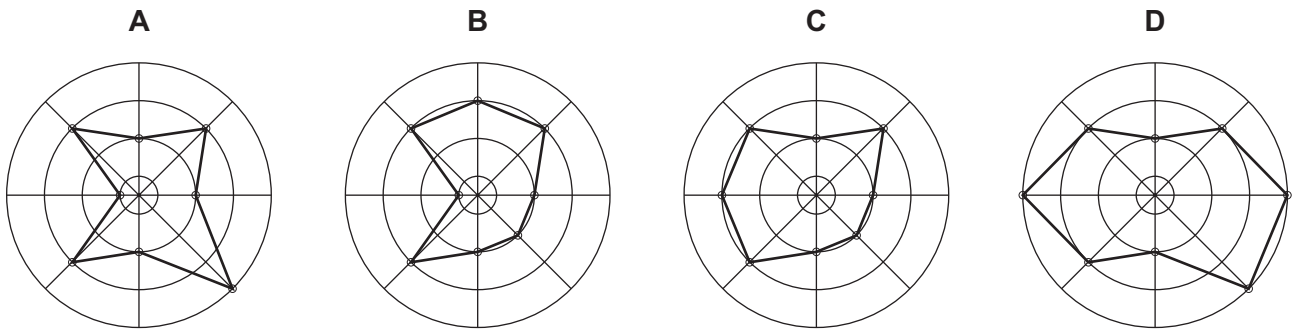
What is the minimum width of the square base?

- A 7 cm
- B 8 cm
- C 9 cm
- D 10 cm

- 8 A food processing company holds food tasting sessions to test new lines of food products. Food tasters use a flavour wheel to record their opinions about the food. The eight categories to be considered are each given a mark from 0 to 4. The results are illustrated using a flavour wheel, the centre representing 0 and each increasing circle representing 1, 2, 3 and 4 respectively.

Fruity	3
Sweet	3
Zesty	2
Dry	2
Bitter	2
Crunchy	3
Salty	1
Chewy	3

Which of the flavour wheels represents the data given above?



- 9 A teacher needs to buy at least 31 doughnuts so that each person in her class can have one. The doughnuts come in two different pack sizes:

<i>Number of doughnuts in pack</i>	<i>Price per pack</i>
5	\$2.00
8	\$3.10

All the doughnuts are identical.

What is the least amount of money she needs to spend?

- A \$12.00
 B \$12.20
 C \$12.40
 D \$13.10
- 10 The result of an election using a single transferable voting system is as follows:

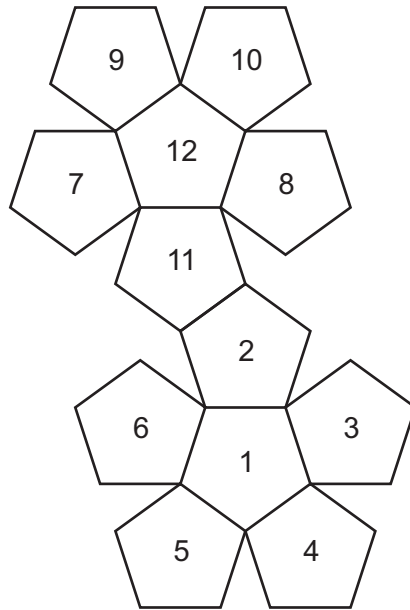
Joe Kerr	21378
Lee Dastray	20702
Paul Oozer	6135

In this voting system, the votes of the candidate in third position are reallocated according to the voters' second choices. Exactly 60% of Paul's votes indicated Lee as second choice, and 40% indicated Joe as second choice.

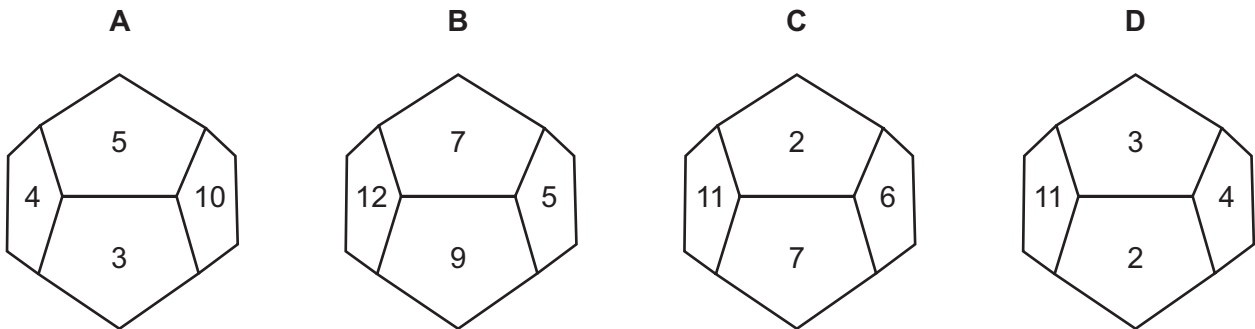
Who will win, and what will the winning margin be, after Paul's votes have been reallocated?

- A Joe Kerr, 676
 B Joe Kerr, 1903
 C Lee Dastray, 551
 D Lee Dastray, 5459

11 This is the net of a dodecahedron intended for use as a die.



Considering only the positions of the numbers, and not their orientations, which of the following is a possible view of the net made into a 3-dimensional shape?



12 Phil Theluca wants to open up a small factory which will work 25 days a month. She produces goods which will only be paid for by the buyers at the end of each month. She pays herself \$120 per day, and is employing a student who is working for \$50 per day.

She has her own capital of \$3000 but she needs to spend:

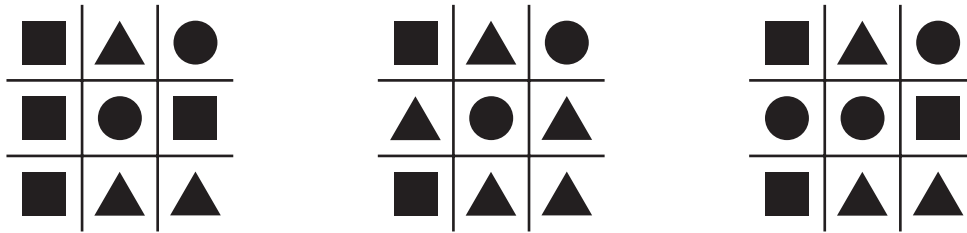
- \$4000 on equipment;
- \$3000 to be paid each month on fixed costs;
- \$1 on the raw materials needed for each of the first 5000 items, and 80¢ for each additional item.

Phil has orders for 10 000 items, but during the month agrees to deliver another 10 000.

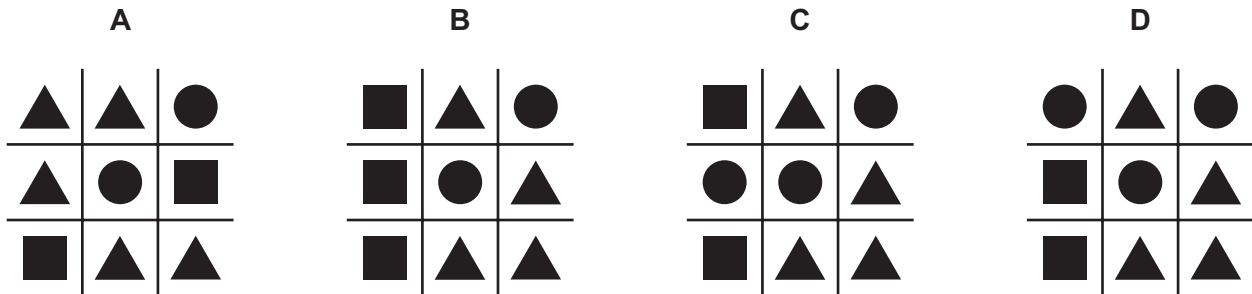
How much will Phil have to borrow from the bank to cover her costs for the first month?

- A \$17 250
- B \$25 250
- C \$26 250
- D \$28 250

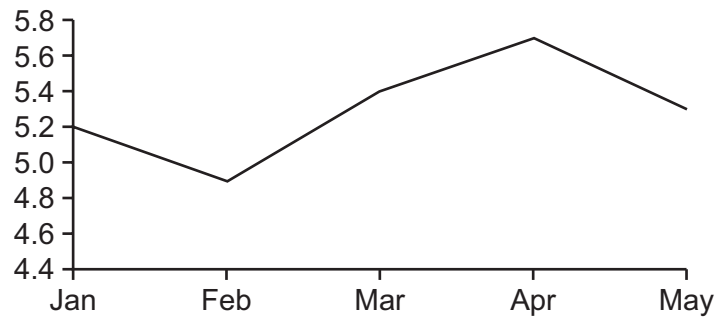
- 13 In a recent competition, participants had to deduce the correct symbol to go in each of the nine squares on a grid. There were only seven entries and none of them was correct. The prize money was shared between the four entries in which eight of the symbols were positioned correctly. Three of the entries that received prizes are shown below.



Which of the following could be the fourth entry that was awarded a prize?



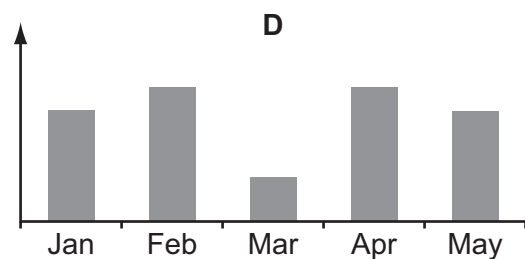
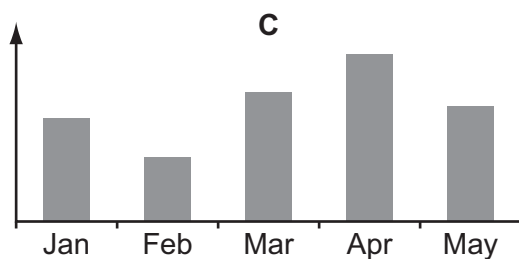
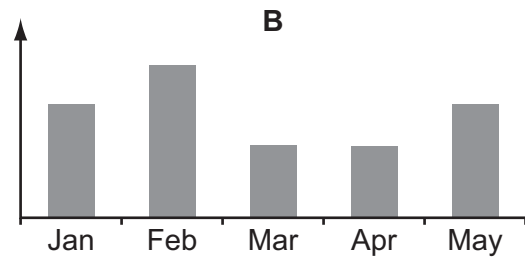
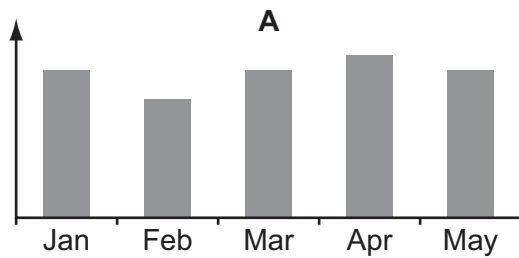
14 The exchange rate over 5 months of the Malaŵian kwacha for one dollar has been:



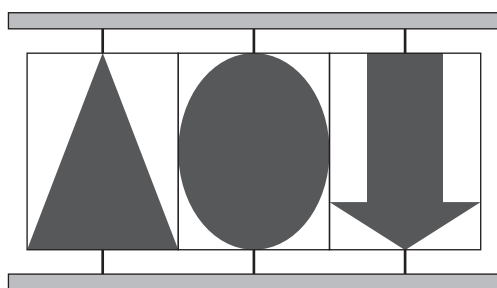
The price of oil in dollars has been:

January	\$79
February	\$80
March	\$76
April	\$80
May	\$77

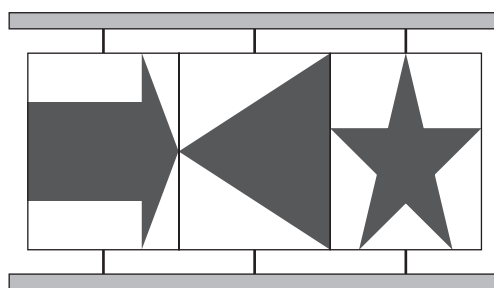
Which one of the following, suitably labelled, could show the price of oil in kwacha?



- 15 A display board is made of three separate screens. Each of the screens is attached to the frame at the top and bottom so that it may be rotated. Each screen shows a picture on each side. The views of the board from the front and back at the moment are shown below.



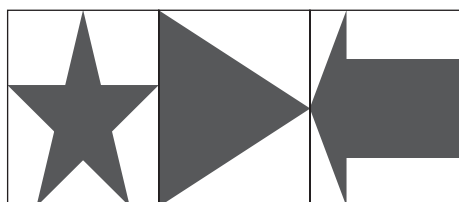
Front



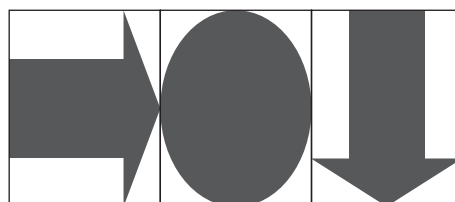
Back

Which of the following could show the view from the front or the back once at least one of the boards has been rotated?

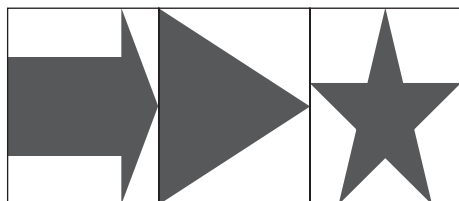
A



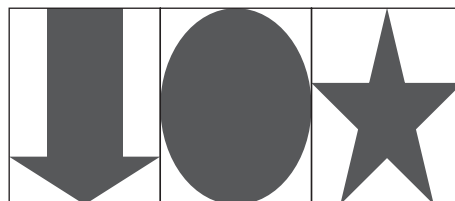
B



C



D



- 16 Bess and Charlie start picking peas at 8 am and finish at 8 pm and take the same lunch break. Bess picks peas at the rate of 25 kg per hour while Charlie only achieves 20 kg per hour.

Which one of the following would be sufficient to determine the length of their lunch break?

- A The difference in total weight of peas picked before and after lunch.
- B The difference in weight of the peas picked in the whole day by Bess and in the whole day by Charlie.
- C The starting time of the lunch break and the weight of peas picked by Bess before lunch.
- D The total weight of peas picked before the lunch break.

- 17 The train service between Easton and Westford leaves Easton every 45 minutes starting at 8 am (8 am, 8.45 am, 9.30 am etc.) and leaves Westford every 45 minutes starting at 8.30 am (8.30 am, 9.15 am etc.). The journey takes 1 hour 20 minutes in either direction.

How many trains going the other way does a train from Easton pass during a single journey to Westford in the middle of the day?

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

- 18 There were 18 goals altogether in the five football matches that were played last night. The total number of goals was different in each match, and only one team failed to score. Four of the matches were won by a one-goal margin, whilst the other one was drawn.

What was the highest number of goals scored in one match?

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

- 19 The unit of currency of Nondecima is the *awk*. There is a whole number of *beks* in an *awk*, and a whole number of *cets* in a *bek*. A visitor has forgotten both how many *beks* there are in an *awk*, and how many *cets* there are in a *bek*. At the first shop he buys 2 cakes costing 3 *awks* 12 *beks* and 4 *cets* each and he has to pay exactly 7 *awks* for these.

Which one of the following explains this?

- A There are 24 *beks* in an *awk*, and 8 *cets* in a *bek*.
- B There are 24 *beks* in an *awk*, and 4 *cets* in a *bek*.
- C There are 25 *beks* in an *awk*, and 4 *cets* in a *bek*.
- D There are 25 *beks* in an *awk*, and 8 *cets* in a *bek*.

- 20 Colin is having some shirts made for the Pedington junior football team. He needs at least 28 shirts (11 in a team plus 3 substitutes and a complete spare set). Four companies quoted for the shirts.

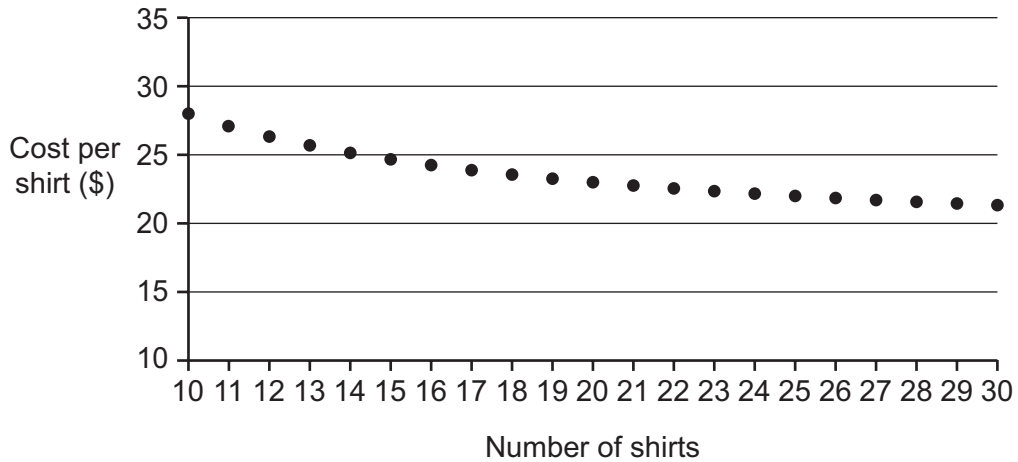
Football Direct: \$100 fixed charge plus \$18 each.

NSC Sports: \$100 for the first shirt, then \$20 per additional shirt.

Super-tees: \$28 each shirt.

X-Sport: \$280 fixed charge for up to 30 shirts.

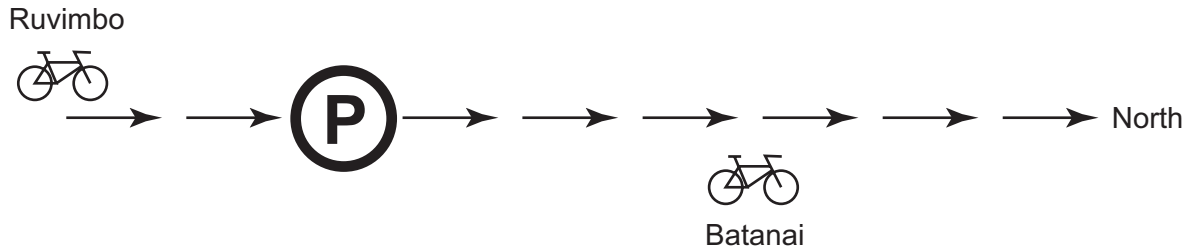
The following graph shows the cost per shirt against the number printed for one of these companies.



Which company's quotation is shown in the graph?

- A Football Direct
- B NSC Sports
- C Super-tees
- D X-Sport

21



Two cyclists travel North. Batanai leaves the parking zone 'P' at 10:00.
At 12:00 Ruvimbo is 30 km South of the parking zone.

Ruvimbo travels at 40 km/hour and intends to take a 15-minute break at the parking zone.

Batanai travels at 20 km/hour.

At what time will Ruvimbo be 20 km ahead of Batanai?

- A 15:00
- B 16:30
- C 16:45
- D 17:00

- 22 Two friends are practising their tennis serve. Adam can serve 6 balls per minute while Mark can serve 4 balls per minute. Adam brings a bag of balls which he serves at Mark. Once Mark has 18 balls on his side of the court he begins serving. Adam continues to serve until his bag is empty and then must wait 11 minutes for Mark to return all the balls.

Assuming no additional time is spent gathering balls, how many balls were in Adam's bag?

- A 44
- B 45
- C 62
- D 96

- 23 The local football league awards 3 points for a win, 2 points for a scoring draw, 1 point for a scoreless draw and no points for a loss. At the start of March the top of the league table looked like this:

Yoxall	38 points
Alrewas	36 points
Rosliston	34 points
Tatenhill	32 points

In the next 6 weeks, these four teams played one another twice, and these were the only matches that they played. The table then looked like this:

Rosliston	48 points
Alrewas	46 points
Yoxall	41 points
Tatenhill	40 points

Which of the following statements about the series of matches **could** be true?

- A All the matches were drawn.
 - B Each team lost at least two matches.
 - C No team won all their matches.
 - D Yoxall did not win any matches.
- 24 In a certain family, the father gives out pocket money to his children in the following way. Every month he chooses a number between 1 and 100, and then shares that amount of money equally between the seven children, giving them whole-number sums of money, and giving anything left over to charity.

For instance, if he chose the number 30, he would give \$4 to each child ($\$4 \times 7 = \28) and \$2 to charity.

If the father realises after 100 months that every number between 1 and 100 (inclusive) has been used once, how much has he given to charity?

- A \$276
- B \$294
- C \$297
- D \$300

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

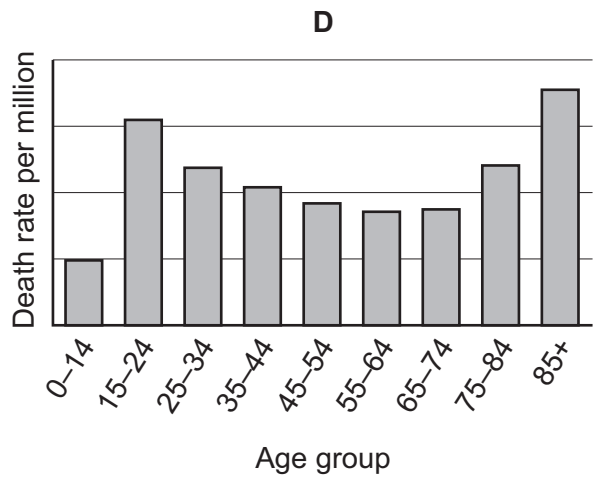
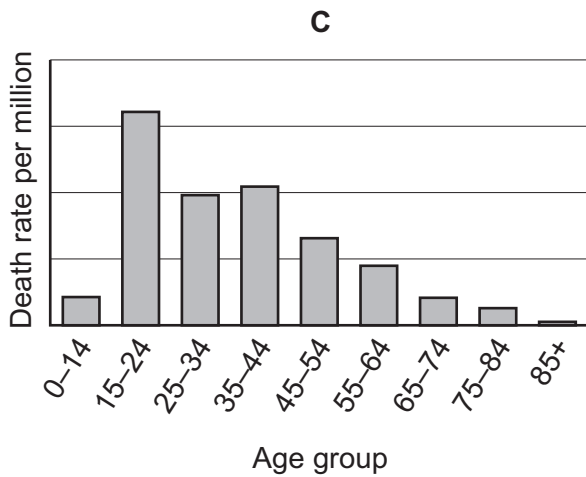
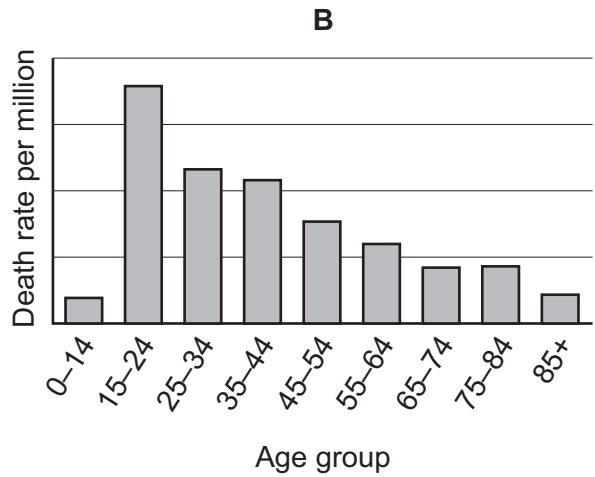
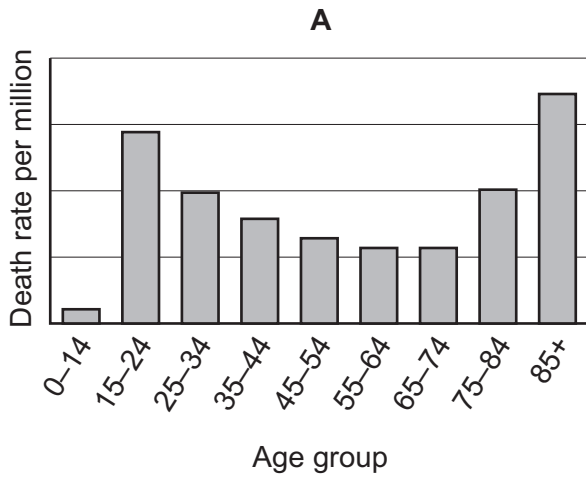
Which one of the pieces has been printed incorrectly?



26 The table below gives the total deaths for males, by age group, in transport accidents for Beniarda in 2008, together with the population of each age group.

Age	Total deaths	Population (millions)
0–14	56	4.89
15–24	536	3.73
25–34	348	3.54
35–44	323	4.03
45–54	230	3.56
55–64	181	3.16
65–74	127	2.16
75–84	131	1.30
85+	66	0.38

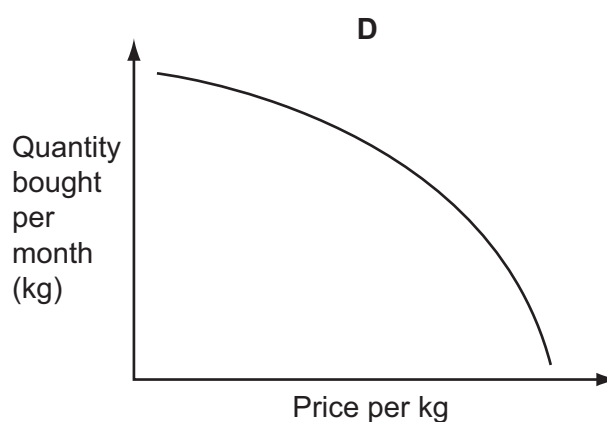
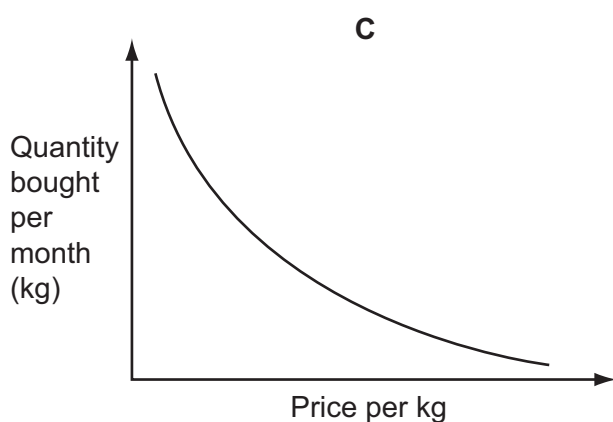
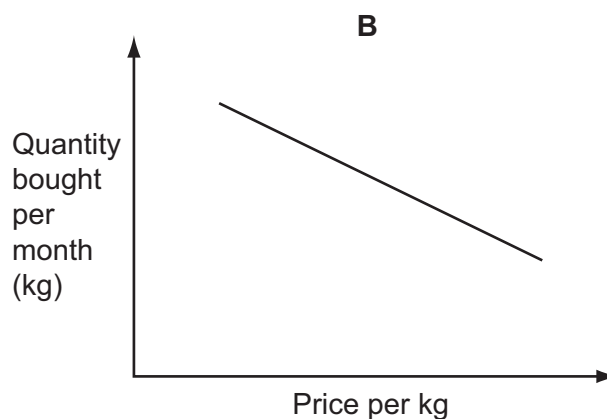
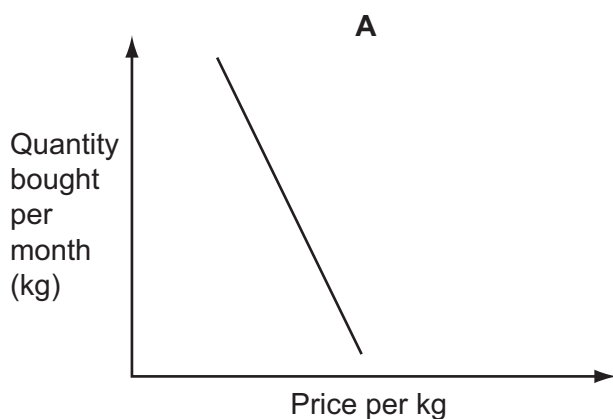
Which one of the following charts best represents the age group annual death rates indicated in the table?



- 27 The table below shows the average monthly price of potatoes facing consumers and the monthly expenditure (to the nearest \$1000) on potatoes in the main market of a city.

Month	September	October	November	December	January	February
Price per kg	\$0.70	\$0.90	\$0.50	\$1.30	\$2.30	\$3.00
Expenditure	\$25 000	\$24 000	\$24 000	\$24 000	\$25 000	\$26 000

Which one of the following graphs, with suitable scales added to the axes, would best illustrate the relationship between the price of potatoes and the quantity in kilograms bought by consumers?



- 28 The table below shows the stocks of blood (in litres), for all the various blood groups, available for transfusions from a country's central blood bank, together with for how many days these stocks would satisfy the average demand for blood of the different groups.

When stocks of a particular blood group get low, the authorities send emails to known donors of that group to encourage them to give blood now, so as to increase stocks. For any blood group with an average demand of less than 250 litres per day, stocks are considered 'low' if there is less than 8 days stock. For groups with an average demand of more than 250 but less than 1000 litres per day, 'low' stock is less than 7 days, while for the common groups with an average demand of more than 1000 litres per day, 'low' stock is less than 6 days.

<i>Blood group</i>	<i>Stock level</i>	<i>Days stock</i>
O positive	15 727	7.14
O negative	3767	6.11
A positive	15 186	8.02
A negative	3461	7.57
B positive	3195	7.07
B negative	737	6.09
AB positive	1165	9.10
AB negative	262	5.95

On the basis of the stocks shown, the authorities contacted known donors of how many blood groups?

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

- 29 When applying for a new job, in April 2013, 47-year-old Philippa had to give her date of birth in the form DD/MM/YYYY and state her current age. In doing so, she found herself using all ten different digits.

In which month of the year is Philippa's birthday?

- A March
- B May
- C June
- D August

- 30 The mean weight of the people in a fitness group is 75 kg. Ava and Bea leave the group and the mean weight of the remaining members of the group is less than it was before they left.

Which one of the following sets of information may **not** be sufficient to calculate the number of people in the original group?

- A The mean weight of Ava and Bea and the percentage decrease in the total weight of the group as a result of Ava and Bea leaving.
- B The individual weights of Ava and Bea and the average weight of the remaining group.
- C The percentage decrease in the mean weight of the group as a result of Ava and Bea leaving and the number of people in the original group who weigh less than 75 kg.
- D The total weight of the remaining group and the drop in the mean weight as a result of Ava and Bea leaving.

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