

THINKING SKILLS

9694/12

Paper 1 Problem Solving

May/June 2018

1 hour 45 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.

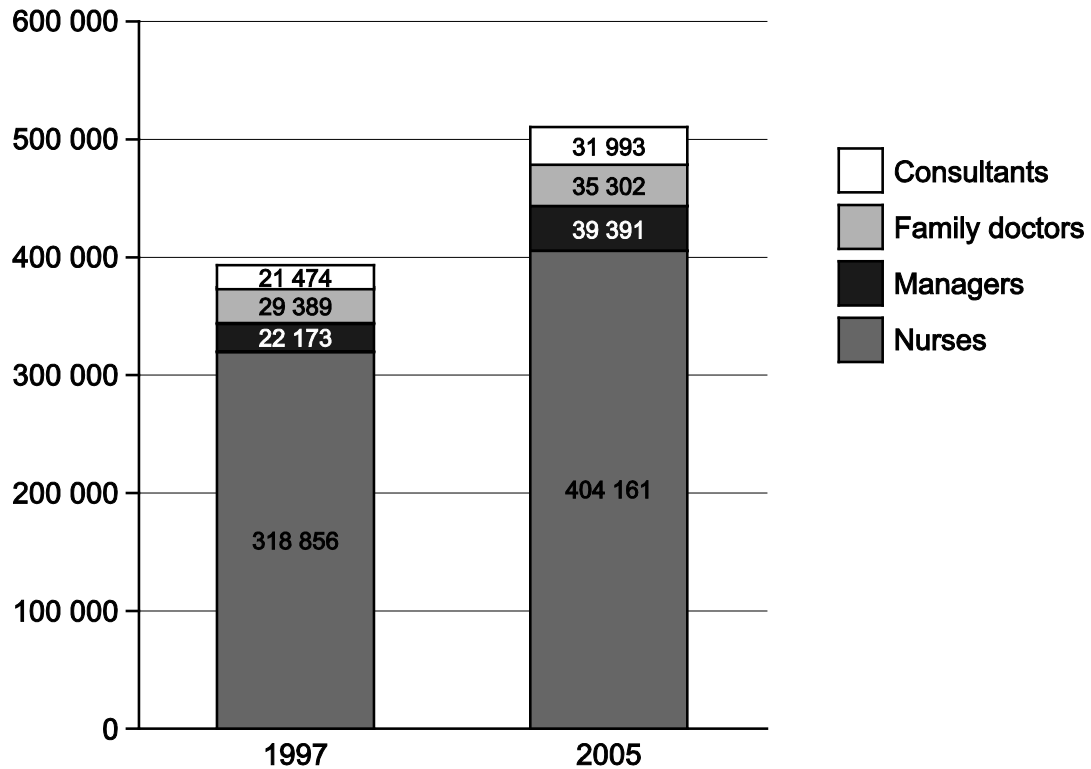
DO **NOT** WRITE IN ANY BARCODES.

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.

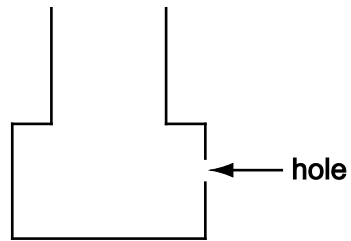
1 The chart below shows the staff numbers in the UK National Health Service in 1997 and 2005.



Which category showed the biggest percentage increase between these dates?

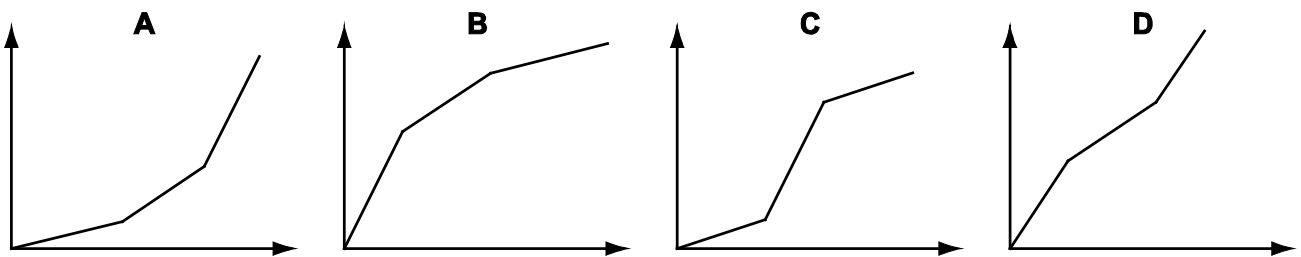
- A Consultants
- B Family doctors
- C Managers
- D Nurses

- 2 The diagram shows the shape of a container that is made from two cylindrical sections.

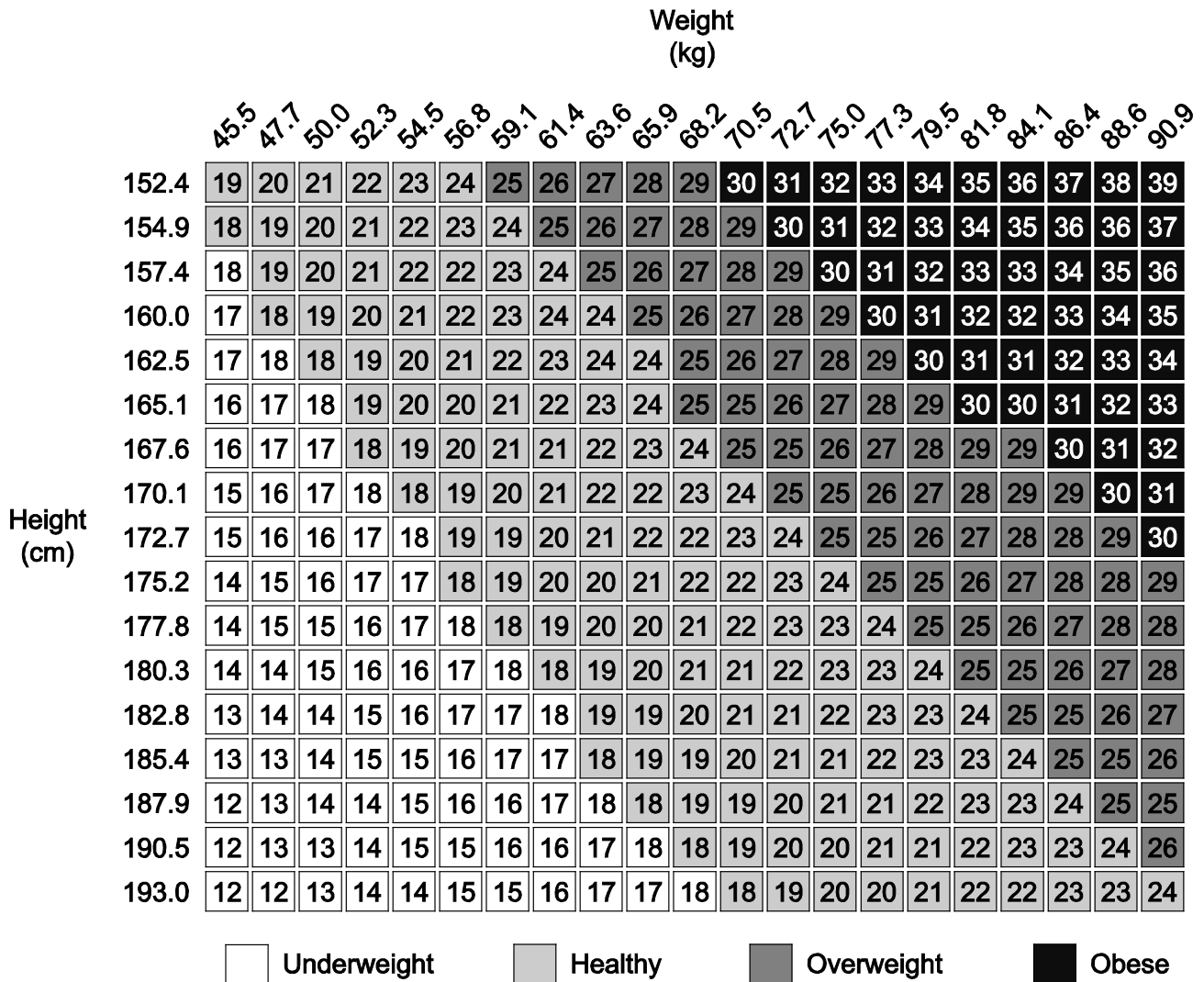


There is a hole in the bottom cylinder of the container. Water is poured into the container at a constant rate. Once the level of water has reached the hole, water starts to leak out at a constant rate that is half the rate at which water is being poured in.

Which graph best represents the rise in the level of water in the container?



- 3 Tom has felt for a period of time that he is overweight, and that he would like to have a healthy weight. He is 160cm tall and 75kg in weight. A Body Mass Index (BMI) is a measure of someone's weight in relation to height; $BMI = \text{weight}/\text{height}^2$.



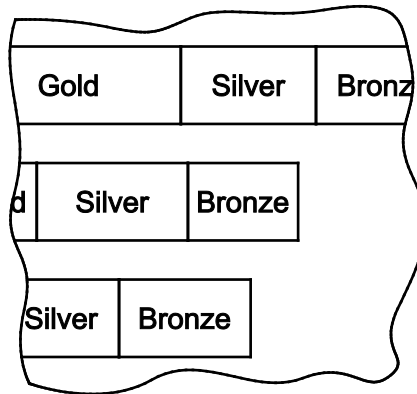
What is the minimum weight Tom would have to lose in order to be a healthy weight?

- A 4.0 kg
- B 5.0 kg
- C 9.1 kg
- D 11.4 kg

- 4 This table lists the most successful countries at the 2012 Olympic Games according to the total number of medals won.

| <i>Country</i> | <i>Gold</i> | <i>Silver</i> | <i>Bronze</i> | <i>Total</i> |
|----------------|-------------|---------------|---------------|--------------|
| USA | 46 | 29 | 29 | 104 |
| China | 38 | 27 | 23 | 88 |
| Russia | 24 | 26 | 32 | 82 |
| Great Britain | 29 | 17 | 19 | 65 |
| Germany | 11 | 19 | 14 | 44 |
| Japan | 7 | 14 | 17 | 38 |
| Australia | 7 | 16 | 12 | 35 |
| France | 11 | 11 | 12 | 34 |

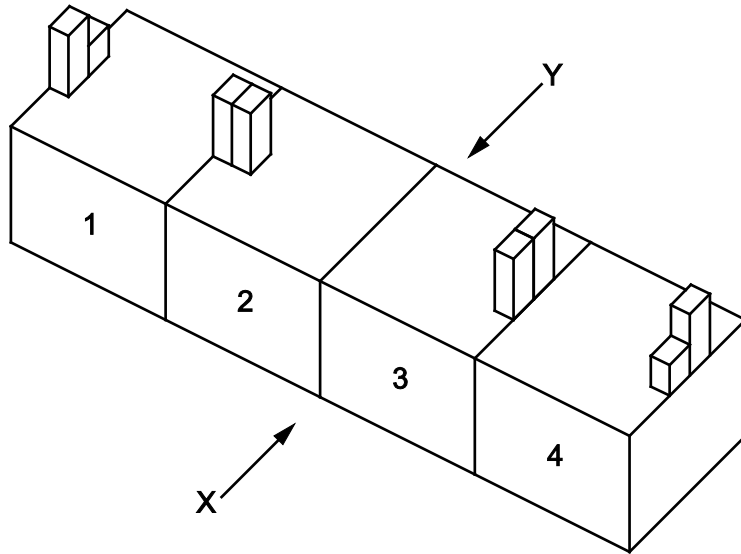
The following is part of a bar chart showing the same information in the same order:



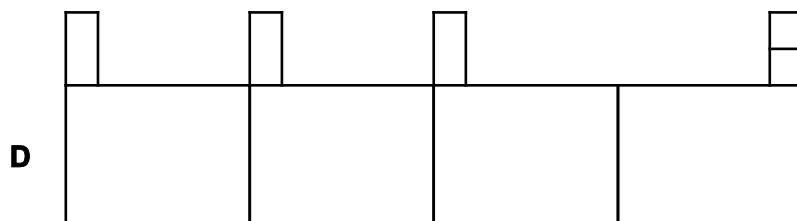
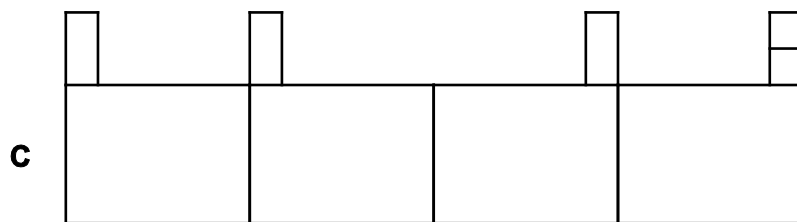
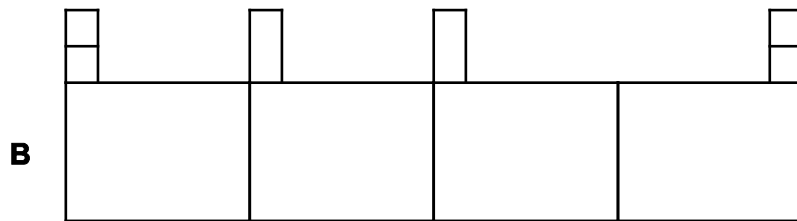
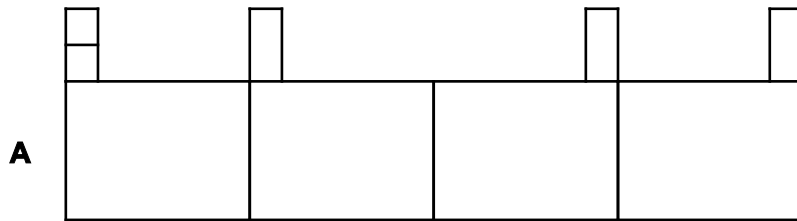
Which three countries feature on this portion of the bar chart?

- A** China, Russia and Great Britain
- B** Russia, Great Britain and Germany
- C** Great Britain, Germany and Japan
- D** Germany, Japan and Australia

- 5 The diagram below shows a row of 4 cottages. Number 2 is in such poor condition that it is going to be completely demolished and be replaced by an exact copy of number 3 as seen from X.



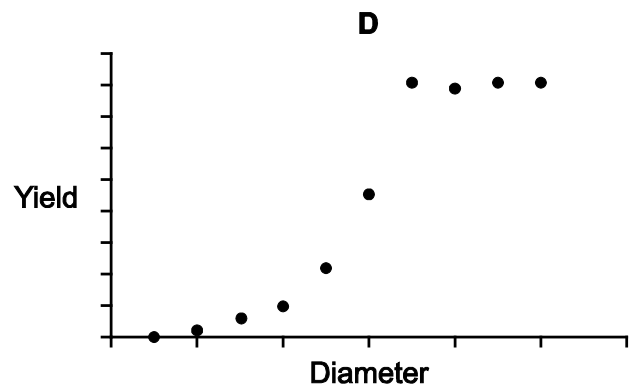
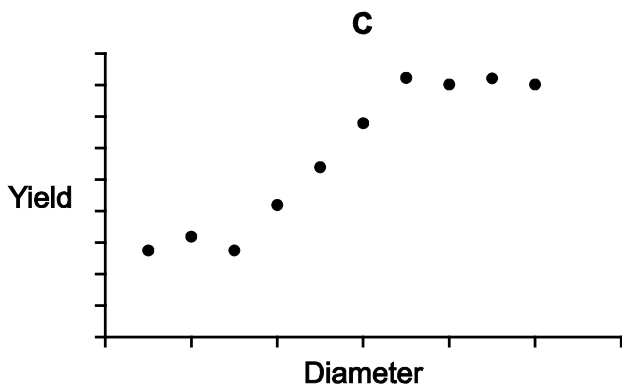
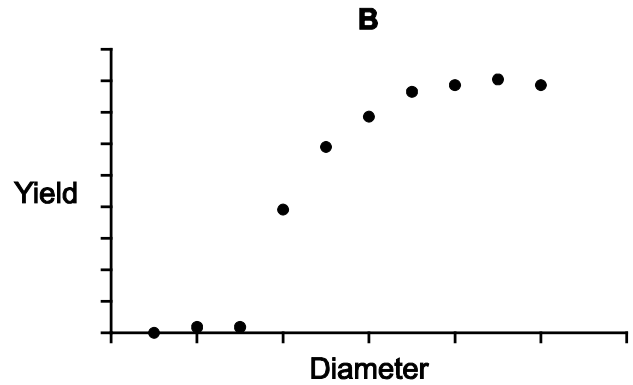
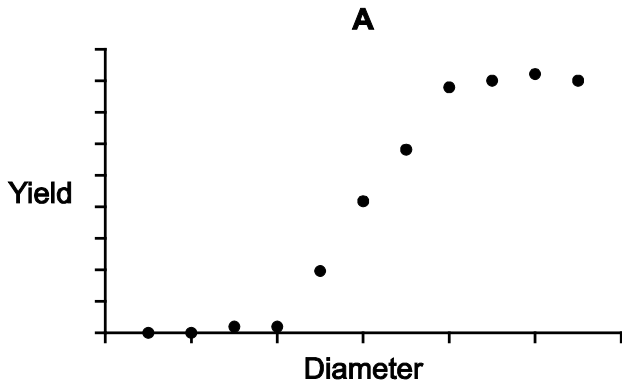
Which of the following will be the view from Y when the replacement is complete?



- 6 Daphne conducted an experiment to see how the yield of a pepper plant was determined by the size of the container in which it grew. She took a number of cylindrical containers of the same height but with different diameters and planted a pepper plant in each. She weighed the peppers produced by each plant, calling the total weight its 'yield'.

When she analysed her results she came to the following conclusion: you need to have a minimum container size before you get a non-negligible yield; then for every 10 cm increase in diameter the yield goes up by the same amount, until at some large diameter the yield effectively stops increasing at all.

Which one of the following scatter graphs is most likely to be Daphne's results?



- 7 A sportsman is given a rehabilitation program to follow after knee surgery, to regain full fitness. The trainer sets out a running program, instructing him to run for 12 minutes on each of the seven days for the first week. For the second week, he should run for 18 minutes each day, and the daily time should then increase by 6 minutes each week thereafter.

How many minutes will he have run in total when he completes a 30-minute run for the first time?

- A 378
 B 408
 C 450
 D 588
- 8 Varsha wants to stay in Bolandia City for four nights and has a choice of four hotels. She will stay at the same hotel for all four nights. She requires internet access throughout her stay and breakfast each morning.

| <i>Hotel</i> | <i>Room rate</i> | <i>Internet</i> | <i>Breakfast</i> |
|--------------|--|---------------------|---------------------|
| Ambassador | \$50 per night, 10% reduction on the nightly rate after the second night | \$5 per night | Included |
| Central | \$60 per night, 20% reduction on the nightly rate after the second night | \$2 per night | Included |
| Luxury | \$55 per night, 20% reduction on the nightly rate after the second night | Included | \$5 extra per night |
| Royal | \$45 per night | \$15 total per stay | \$5 extra per night |

Which hotel is the cheapest option?

- A Ambassador
 B Central
 C Luxury
 D Royal

- 9 Christy is making a piece of artwork using ceramic tiles. The tiles are available in four colours and two finishes, as shown in the following table. The cost of boxes of the tiles is also shown.

| Colour | Finish | Quantity | | |
|--------|--------|-----------------|-----------------|-----------------|
| | | Box of 10 tiles | Box of 20 tiles | Box of 50 tiles |
| White | Gloss | \$20 | \$36 | \$90 |
| | Matt | \$18 | \$33 | \$85 |
| Red | Gloss | \$18 | \$34 | \$86 |
| | Matt | \$16 | \$30 | \$82 |
| Blue | Gloss | \$25 | \$45 | \$108 |
| | Matt | \$24 | \$44 | \$106 |
| Black | Gloss | \$24 | \$44 | \$105 |
| | Matt | \$22 | \$40 | \$100 |

Christy needs 80 white matt tiles and 80 blue gloss tiles.

What is the least that it will cost her to buy the tiles?

- A** \$306
B \$310
C \$312
D \$314
- 10 Five football fans regularly travel to away matches to watch their team. To organise this, Dave buys the match tickets and Alan books the train tickets. For the next away game the cost of the match tickets was \$310 and the train tickets \$125. To make it simple for everyone to pay, Dave calculates how much each person should pay, collects the total amount and pays Alan what he is owed.

How much money should Dave pay Alan?

- A** \$38
B \$62
C \$87
D \$100

11 Tonight the five TV channels in Bolandia are showing the following programmes:

| Ett | Två | Trä | Fyra | Fem |
|---|-----------------------------|--------------------------------|---|----------------------|
| 7.00 The News | 6.30 Snookered | 7.00 Wash with mud | 7.00 Film: Toad Hole | 6.50 Weather |
| 7.15 Film: The Grindstones | 7.30 Film: The odd dash | 7.45 Film: The 39 Satraps | 8.00 Other University: the Oxford Comma | 7.00 Film: Ma tante |
| 8.30 Seamus Green's grilled bear | 8.30 Life in the fridge | 9.45 Film: Flops of the bottom | 8.15 Film: DX/DY | 8.15 Film: Honeywood |
| 9.00 Film: Shorts from the Tin Festival | 8.45 The Undersea Leagues | 10.45 X-not | 8.45 Railway Whistle Test | 9.10 Now we are five |
| 9.30 Film: Brown Beauty | 9.00 Film: Wild Raspberries | | 9.45 Film: Bad, Ugly and Worse | 9.45 Veckan |
| 11.00 Highlights from A&E | 10.00 Tonite – an explosive | | | |

Spud simply wants to spend as much time as he can watching films, but only if he can see the whole of each film. He needs to stop watching TV and go to bed at 9.30.

Which one of the following programmes could he watch as well as films?

- A Life in the fridge
- B The Undersea Leagues
- C Other University
- D The News

12 In a class of 30 children, exactly 10 are left-handed and exactly 15 wear glasses.

Which one of these statements can be deduced from this information alone?

- A At least 5 people are both left-handed and wear glasses
- B At least 5 people are neither left-handed nor wear glasses
- C At most 5 people are both left-handed and wear glasses
- D At most 5 people are neither left-handed nor wear glasses

- 13 The sign at the entrance to Barry's shop reads:

A WORLD OF FRUIT

Barry wants to change the sign to:

FRUIT DELIGHT

The letters in the sign are separate and can be moved or removed at no cost. However, each new letter he needs to buy will cost the amount shown in the table below.

| <i>Letters</i> | <i>Cost per letter (\$)</i> |
|----------------|-----------------------------|
| I J L T V X | 35 |
| A E F H N Y Z | 40 |
| B C D M P U W | 45 |
| G K O Q R S | 50 |

How much will it cost Barry to change the sign?

- A \$130
 B \$185
 C \$200
 D \$275
- 14 A currency exchange shop will convert between Bolandian dollars (\$) and Great British Pounds (£).

Bolandian Dollars – Great British Pounds

We sell \$1 for £1.50

We sell £1 for \$0.70

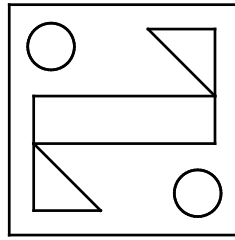
No additional charges!

Malcolm converts £630 into Bolandian dollars, and then changes his mind and converts it back into Great British Pounds.

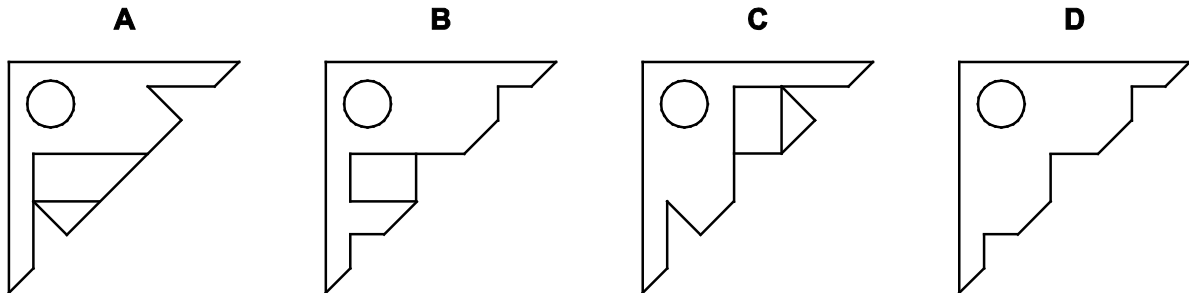
How much money does he lose by doing this?

- A £21.00
 B £30.00
 C £31.50
 D £45.00

- 15 The square piece of paper shown below has five holes cut into it. It is folded so that the two circles overlap.



Which diagram shows what the resulting paper could look like?



- 16 Hazel gets the opportunity to buy tickets in advance of a concert at a discount. She knows that it will be easy to resell these tickets at their face value just before the concert takes place. The discounts offered are in the table below.

| | | | |
|-------------------|------|------|------|
| Ticket face value | \$40 | \$30 | \$20 |
| Discounted price | \$30 | \$23 | \$17 |

Hazel gets all her money together and finds that she can spend no more than \$351 on the discounted tickets. She decides she will re-sell every ticket she buys and try to make the most profit she can from this resale.

What is the most profit she can make?

- A \$109
- B \$110
- C \$113
- D \$114

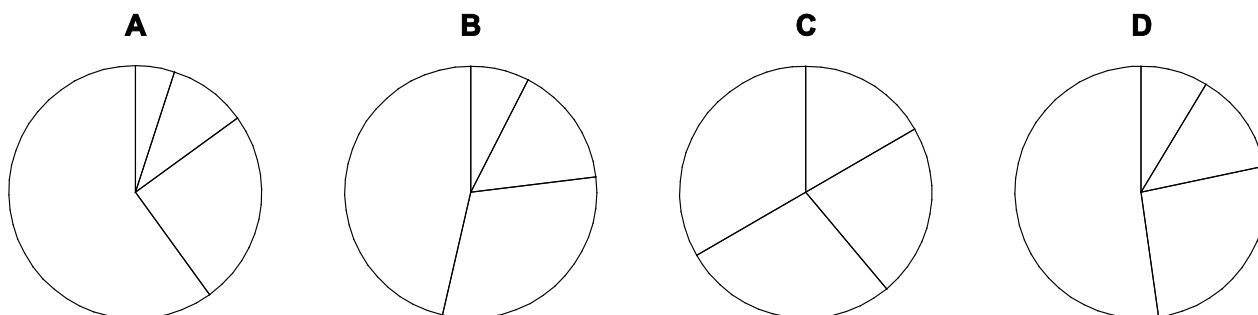
- 17 There is an hourly train service from London to Lichfield. The time for this journey is 90 minutes and the average speed for the journey is normally 120 km/h.

Yesterday the 18:00 train started late. For the first third of the total distance, it was following a slow train and averaged only 60 km/h. The second third was covered at an average speed of 90 km/h. For the final third, it was able to reach its normal average speed of 120 km/h. The train arrived in Lichfield at 20:40.

At what time did the train leave London?

- A 18:25
 B 18:30
 C 18:35
 D 18:40
- 18 Tickets for seats at a Grand Major tennis final were sold at four different prices:
 Type P at \$120, Type Q at \$80, Type R at \$40 and Type S at \$20.
 There were 600 tickets available, in the ratio 1 Type P : 2 Type Q : 5 Type R : 12 Type S.
 All the tickets were sold.

Which of the following pie charts, suitably labelled, could represent the total amount of money collected from each type of ticket?



- 19 A class of students was shown the following list of countries, the names of which are all made up of seven letters:

AUSTRIA
BAHRAIN
ECUADOR
FINLAND
GRENADA
HUNGARY
MOLDOVA
SENEGAL
UKRAINE

Four of the students were asked to choose one of the countries from the list. Each of them then had to give their classmates one clue about their country, referring only to the letters making up the country's name.

Samantha said: "My country's letters are all different."

Malcolm said: "My country has more vowels than consonants."

Esther said: "My country is made up of consonants and vowels alternately."

Nigel said: "My country has more letters from the second half (N–Z) of the alphabet than the first half (A–M)."

Whose clue was sufficient for their classmates to know for certain which country they had chosen?

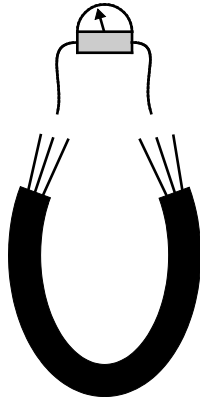
- A Esther's
 - B Malcolm's
 - C Nigel's
 - D Samantha's
- 20 The cost of a ticket at the Bolandia Arena is made up of three parts: a basic price, an administration charge, and a donation to charity. In 2012, the basic price and the administration charge were in the ratio 3 : 1 and the charity donation was \$5. In 2013, the basic price of a ticket was increased by 10%, the administration charge was increased by 5% and the charity donation was \$4.

What was the cost in 2013 of a ticket that in 2012 cost \$69?

- A \$69.60
- B \$72.00
- C \$73.60
- D \$78.60

- 21 An electrician needs to match up the left-hand ends of three wires with their right-hand ends at the other end of a sealed pipe.

She can carry out a conductivity test between any left-hand end and any right-hand end to see if they are connected or not. She wants to perform as few tests as she can.



If she adopts the best strategy, what is the maximum number of tests that she might need to do?

- A 2
 - B 3
 - C 4
 - D 5
- 22 Every day I drive to work. The journey normally takes me a total of 36 minutes at my usual speed of 60 km/h. However, during the past week there have been roadworks for part of the journey, and I have been able to drive at only 40 km/h through this section. No other part of my journey changed and the time that it took me to get to work each day was 42 minutes.

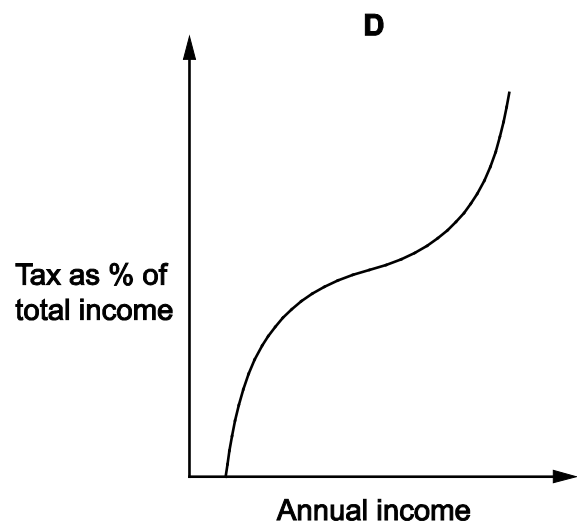
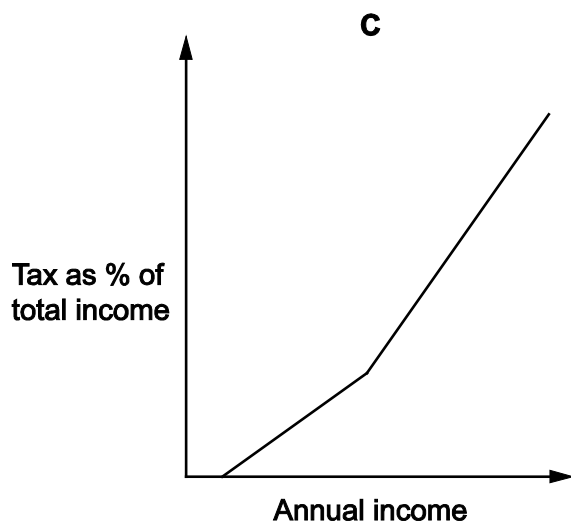
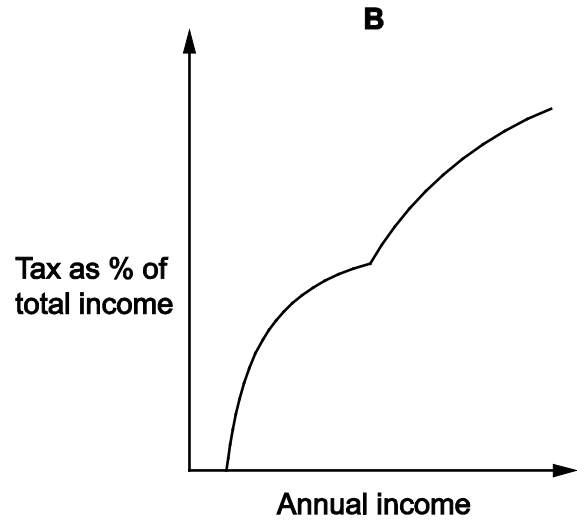
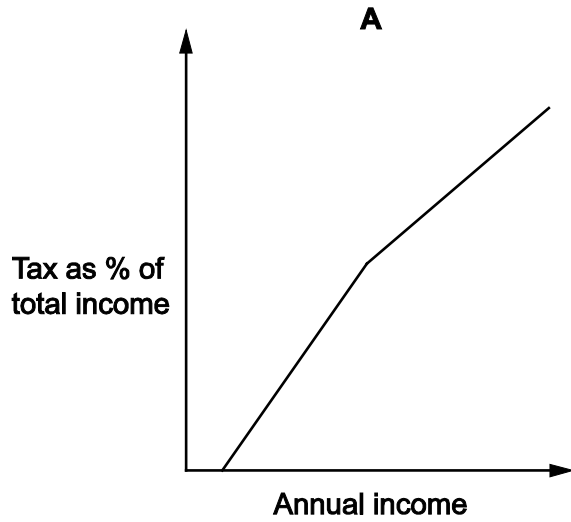
What is the length of the roadworks on my route to work?

- A 2 km
- B 12 km
- C 18 km
- D 36 km

23 The citizens of Bolandia pay income tax on their annual earnings as follows:

- No tax is payable on the first \$10 000.
- The next \$40 000 (from \$10 001 to \$50 000) is taxed at a rate of 20%.
- All income above \$50 000 is taxed at a rate of 40%.

Which one of the following graphs shows how income tax paid by Bolandian citizens as a percentage of total annual income varies for incomes up to \$100 000?



24 The ages of the four Pitcher sisters are 21, 19, 16 and 11.

A recent newspaper article named the sisters as Poppy (21), Ivy (19), Lily (16) and Rosemary (11). Unfortunately, the reporter had managed to get every one of their ages wrong.

Which of the following additional pieces of information would, by itself, enable you to be sure that the correct ages of Poppy, Ivy, Lily and Rosemary are 19, 11, 21 and 16 respectively?

- A** Ivy is the youngest and Lily is the eldest
- B** Lily and Poppy are over 18
- C** Poppy's and Rosemary's ages add up to 35
- D** Rosemary is five years older than Ivy

25 Becky, Alexa, Meagan and Fiona are sisters who are trying to arrange an online call. Becky lives in London. Alexa lives in San Diego, which is 8 hours behind London time. Meagan lives in New York, which is 5 hours behind London time. Fiona lives in Beijing, which is 7 hours ahead of London time. Each of the sisters is happy for the call to take place between 06:00 and 22:00 local time.

For how many hours in a day will at least three of the four sisters be available for an online call?

- A** 12
- B** 14
- C** 15
- D** 16

26 When Grandpa Ben won \$240 in a competition he decided to share it between his two grandchildren, Thomas and Jessica, in the ratio of their ages. 6-year-old Jessica was not happy that she received \$60 less than Thomas, but Ben promised her he would make sure that she would not be disappointed next time.

When he won another sum of money exactly two years later, he split the money in the updated ratio of their ages, but this time gave Jessica the larger share. Jessica was delighted, particularly as this time she received \$70 more than Thomas.

How much did Grandpa Ben win on the second occasion?

- A** \$280
- B** \$315
- C** \$350
- D** \$420

- 27 In a recent election at Staylmayt Chess Club there were five candidates for the three vacant committee positions.

Club members were allowed to give one vote each to up to three of the candidates. 80 members cast at least one vote and nobody tried to vote for more than three candidates.

The result of the election was as follows:

| | |
|----------|----------|
| P King | 63 votes |
| A Bishop | 44 votes |
| W Knight | 35 votes |
| N Castle | 21 votes |
| S White | 17 votes |

Which one of the following statements about the votes cast in this election is **not** necessarily true?

- A** The number of members who voted for three candidates was 50 or less
- B** A greater number of members voted for three candidates than for one candidate only
- C** The number of members who voted for exactly two candidates was 60 or less
- D** A greater number of members voted for exactly two candidates than for one candidate only
- 28 Canal building was a very expensive task. Digging the route cost \$10 000 per kilometre. In addition to this:
- locks cost \$15 000 each;
 - tunnels cost \$20 000 per 100 metres;
 - aqueducts cost \$25 000 per 100 metres.

Four routes for a new canal from Leek to Uttoxeter were suggested.

Which route would have been the least expensive to build?

| <i>Route</i> | <i>Length</i> | <i>Locks</i> | <i>Tunnels</i> | <i>Aqueducts</i> |
|--------------|---------------|--------------|----------------|------------------|
| A | 40 km | 8 | 3 x 600 m | 1 x 600 m |
| B | 45 km | 6 | 2 x 400 m | 2 x 400 m |
| C | 50 km | 8 | 3 x 200 m | 3 x 200 m |
| D | 80 km | 6 | 2 x 400 m | 1 x 500 m |

- 29 There are 18 delegates at a conference. 7 speak only English, 5 speak only French and 4 speak only Spanish. 1 delegate speaks both English and French, and the remaining 1 speaks English and Spanish. They are formed into 6 groups of three, and in 5 of these groups the three members can speak a common language. In the 6th group there is no common language spoken by all three members.

Which of the following **cannot** be true for the 6th group?

- A Two of the group speak only English
 - B Two of the group speak only French
 - C The person who speaks both English and French is in the group
 - D The person who speaks both English and Spanish is in the group
- 30 Henry has a collection of identical cubic painted bricks. Each brick has a face painted red (R), opposite a face painted blue (B), and a face painted orange (O), opposite a face painted purple (P). The other two faces on all bricks are painted green (G) and yellow (Y).

Henry piles the bricks at random in columns of 6. He rejects all columns that do not have two sides of the column showing all 6 colours. He describes each column by the list of colours on one side, reading from top to bottom.

Which one of the following columns might **not** be rejected?

- A R,R,R,R,B,O
- B O,O,O,O,R,B
- C O,O,O,P,P,P
- D R,R,R,B,B,O

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