Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

THINKING SKILLS **9694/13**

Paper 1 Problem Solving **October/November 2016**

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.

IB16 11_9694_13/2RP

1 There were three candidates for the post of President of Birkfield Golf Club in this year's election. Each club member was entitled to cast up to five votes in the election. He/she could give all five votes to one candidate or divide them between two or all three of them, but was not obliged to use all five of his/her votes.

The results of the election were as follows:

George Dale	287 votes
Anne Muir	232 votes
Andrew Lake	63 votes

Which one of the following statements about the election must be true?

A At least fifteen members voted for Andrew Lake

B More members voted for George Dale than for Anne Muir

C Not all members who voted used all five of their votes

D Some members voted for all three candidates

2 In Bolandia, either both people shaking hands wear gloves or neither does.

Some people insist upon wearing gloves if they are going to shake hands, some will not shake hands if wearing gloves, and everyone else does not care, but will put them on or take them off as needed.

Angus observed some of the handshakes between six people at a reception and recorded the results.

	William	Lucinda	Richard	Teddy	Alfred
Morag	×	×	×		
William		✓			✓
Lucinda			×	✓	
Richard				✓	✓
Teddy					

Key: ✓ with gloves × without gloves (blank) handshake not seen

For how many of these people can Angus be sure that they do not care whether or not they wear gloves?

A 1

B 2

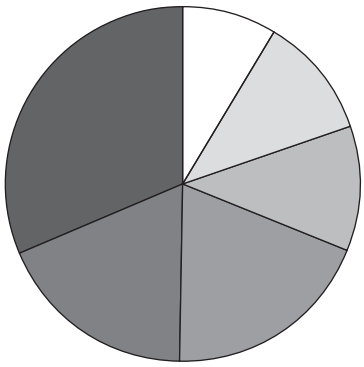
C 3

D 4

3 The data below shows the annual energy consumption of kitchen appliances in a typical house.

Appliance	*Usage*	*Consumption*	*Cost per year*	*kg CO_2 per year*	*kWh per year*
Electric Hob	424 uses per year	0.71 kWh per use	$30.10	129	301.00
Electric Oven	135 uses per year	1.56 kWh per use	$21.08	91	210.60
Fridge-Freezer	24 hours a day	206 kWh per year	$20.60	89	206.00
Kettle	1542 uses per year	0.11 kWh per use	$16.90	73	169.00
Washing Machine	187 washes per year	0.63 kWh per wash	$11.78	51	117.80
Dishwasher	110 uses per year	1.07 kWh per use	$11.77	51	117.70
Microwave Oven	96 times per year	0.95 kWh per use	$9.07	39	91.20

The pie chart illustrates the data for kWh per year but, unfortunately, there is no key and one appliance has been missed off the chart.



Which appliance has been missed?

A Electric hob

B Electric oven

C Kettle

D Microwave oven

4 I have a 250 litre water butt in my garden which collects rainwater from the roof. It was full 15 days ago, but there has been no rain since then. The water from the butt is used to feed a water feature which uses 10 litres a day, but I turned that off 5 days ago. I have also used it every day to water plants in my garden.

The water butt has just run dry as I finished watering for today.

How much water do I use on average each day to water my plants?

A $6\frac{2}{3}$ litres

B $7\frac{1}{2}$ litres

C 10 litres

D 15 litres

5 Kevin has five pieces of work that he needs to do at the weekend. The pieces of work require 25 minutes, 50 minutes, 75 minutes, 95 minutes and 110 minutes to complete. Kevin is able to spend up to 3 hours working on Saturday and wants to spend as little time as possible completing the remaining work on Sunday. However, he will only start a piece of work if he has time to finish it.

How long will Kevin need to spend on the work on Sunday?

A 170 minutes

B 175 minutes

C 180 minutes

D 185 minutes

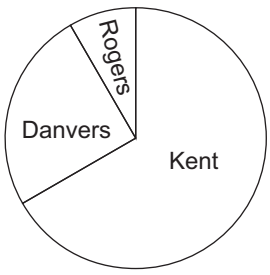
6 Peter Kent is to be Heroville's new Mayor.

The votes cast for the three candidates in last week's mayoral election were as follows.

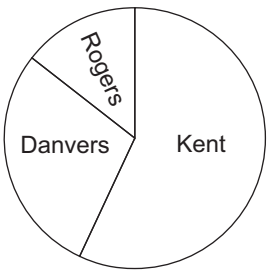
Peter Kent	21 608
Diana Danvers	10 786
Bruce Rogers	3595

Which of the following pie charts best illustrates the results of the voting in last week's election?

A



B



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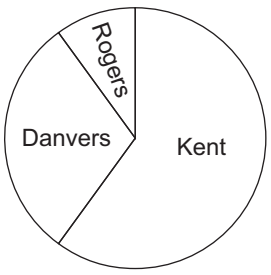
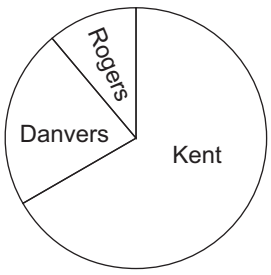
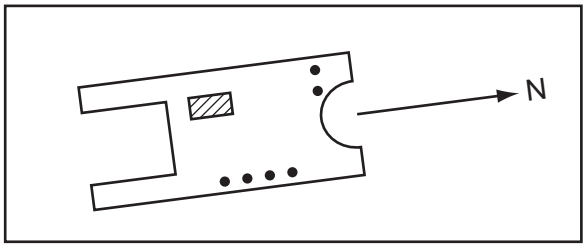


D



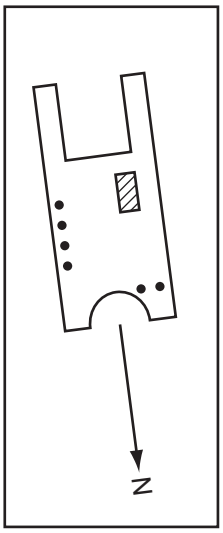
7 This is a plan of a recently-excavated ancient building, which an archaeologist drew on a sheet of transparent plastic. The diagram shows the sheet of plastic face upwards. The arrow indicates the direction of north. A student picked up the sheet of plastic, which was lying as shown here.



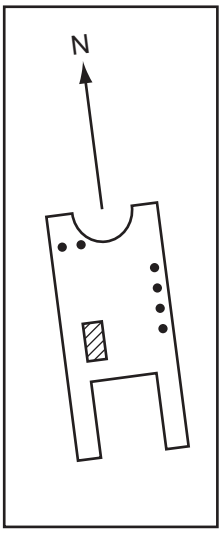
She then laid it face downwards, so that the 'N' arrow was still pointing to the right, and then rotated the sheet of plastic 90 degrees clockwise.

Which one of these plans correctly represents what the student saw when she had performed the actions listed above?

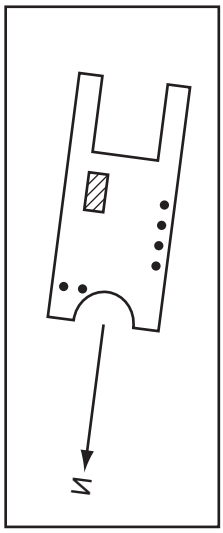
A



B



C



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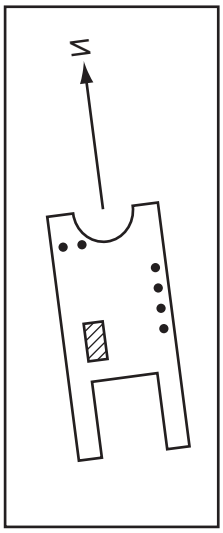


8 David is buying a new car and trading in his old one. He visits three garages who make him the following offers:

Hilltop Garage	new car is \$11 100, ⅓ discount for trading in his old car
Valley Garage	new car is \$12 000, 40% off for trading in his old car
Meadow Garage	new car is \$300 per month for 3 years, with \$3400 cashback for trading in his old car

Which offer gives the lowest cost for the new car?

A Hilltop Garage

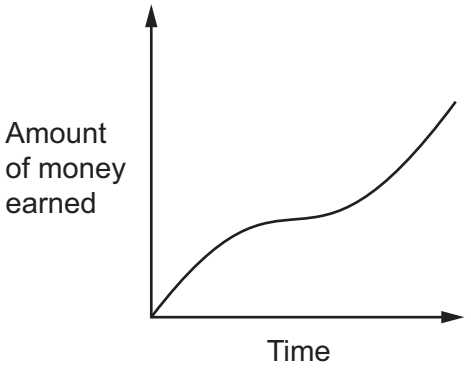
B Valley Garage

C Meadow Garage

D Hilltop Garage and Meadow Garage are both lowest

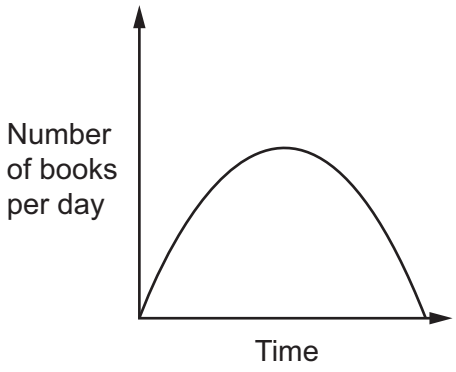
9 Qaylah's father wants to encourage her to read books during her school holiday, so he decides that he will give her $1 every time she finishes reading a book.

Qaylah sketched a graph showing the total amount of money she had accumulated by each day during the holiday.

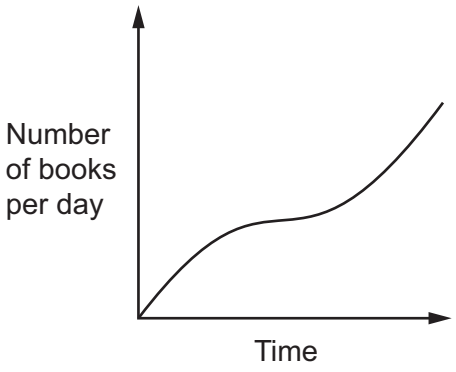


Which one of the graphs below could represent the number of books she read per day during the same time period?

A



B



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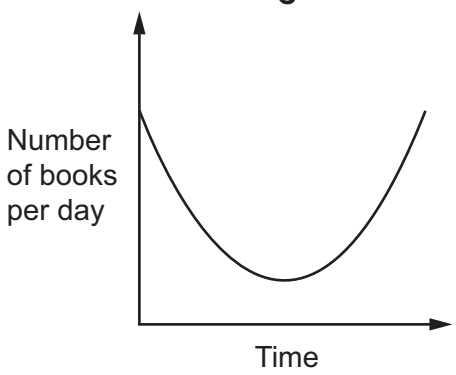

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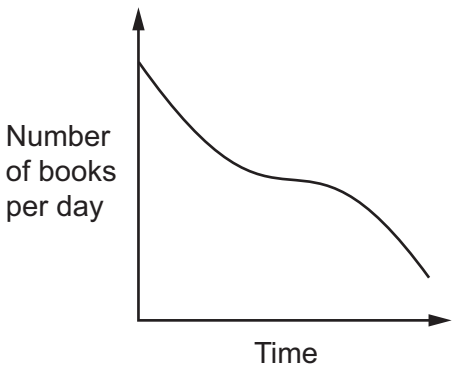


10 At 15:00 Andy leaves Alphaville. He drives due west at a constant speed of 60 km/h.

At 15:00 Brian is 90 km due south of Alphaville and drives at a constant speed of 30 km/h towards the town.

At what time will Andy and Brian be exactly the same distance from Alphaville?

A 15:45

B 16:00

C 16:30

D 18:00

11 1 litre of 'Orange Burst' paint is made by mixing red and yellow paint in the ratio 2 : 3. The person mixing the paint mistakenly reverses the ratio of red to yellow. The mistake can be rectified by adding an amount of yellow paint.

How much yellow paint must be added to the 1 litre mixture to obtain the correct colour for 'Orange Burst' paint?

A 0.4 litres

B 0.5 litres

C 0.6 litres

D 0.9 litres

12 At the end of every month, the local school sends out letters of congratulation to the families of the 20 students who have made the most progress that month. The best 5 students also receive a prize which has to be posted separately.

The letters of congratulation are posted using first class mail, which costs 25¢ each.
The prizes are posted as parcels, which cost 60¢ each.

Next month, the postage fees will be increased, in each case by a whole number of cents. It has been decided that only 4 prizes will be sent out in the future, but there will still be 20 letters. This means that the total cost of sending letters and prizes remains the same.

Which of the following increases in prices would explain this?

A The price of a letter increases by 2¢ and the price of a parcel increases by 4¢

B The price of a letter increases by 2¢ and the price of a parcel increases by 5¢

C The price of a letter increases by 3¢ and the price of a parcel increases by 12¢

D The price of a letter increases by 3¢ and the price of a parcel increases by 15¢

13 At a children's party, Brenda, the winner of a game, was rewarded by being allowed to pick three bags from twelve bags all containing sweets. You could not tell merely from looking at the bags which bag contained any more sweets than any other. Brenda had to choose two bags of one colour and one of a different colour. She chose two yellow bags and one green bag. Before taking these bags, the actual number of sweets in the offered bags was as in the table below.

	Bag 1	*Bag 2*	*Bag 3*
Blue	3	4	6
Green	1	6	7
Red	4	7	8
Yellow	2	3	7

After Brenda had chosen her bags, Dave, the runner-up in the game, was given the opportunity to choose two bags of one colour and one of a different colour. Dave loves sweets and wanted to get as many as is possible.

What was the worst possible outcome for Dave?

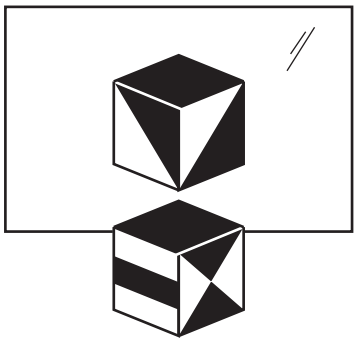
A Dave got a total of 6 sweets

B Dave got a total of 7 sweets

C Dave got a total of 8 sweets

D Dave got a total of 9 sweets

14 The diagram shows a solid cube and its reflection in a mirror.



The bottom face of the cube is white.

Which one of the following could be a view of the cube from another direction?

A

B

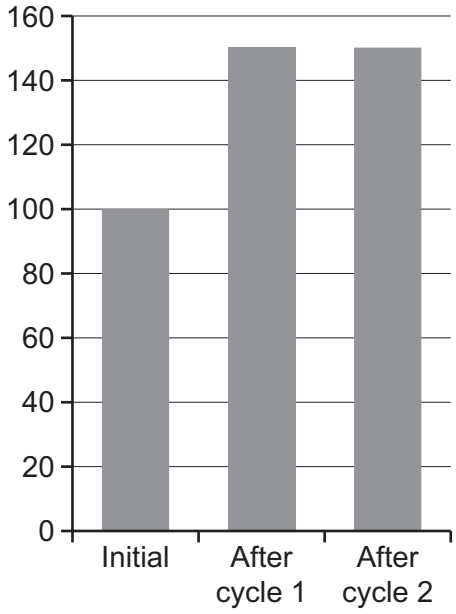
C

D

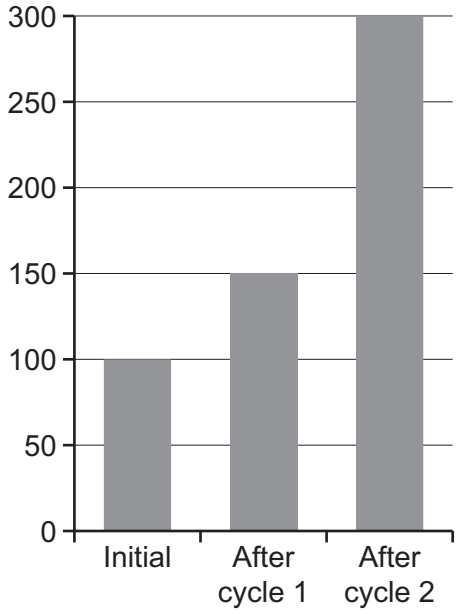
15 An experiment has been set up with an initial population of 50 male and 50 female rabbits. On average, female rabbits have four kittens per cycle: two male and two female. A disease is causing half of all female kittens to die at birth.

Assuming that no other rabbits die during the experiment, which chart shows the expected total population over the next two cycles?

A



B



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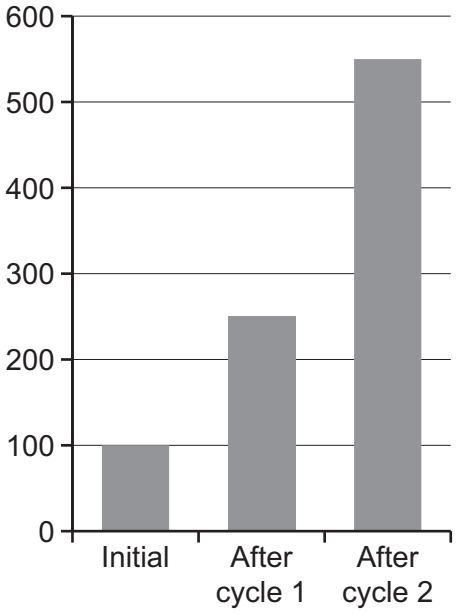
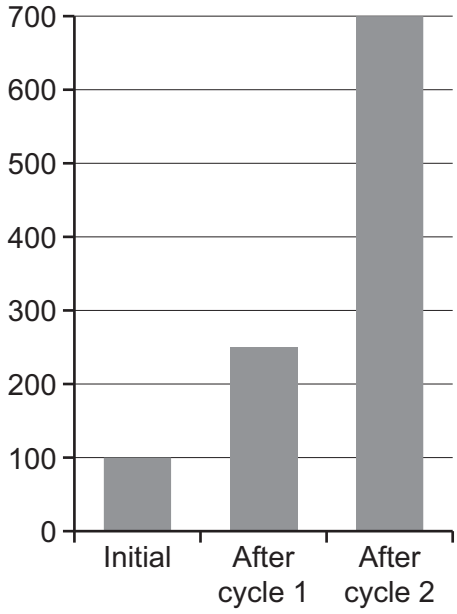


D



16 The Bounty is a sailing ship. On ocean voyages it has the crew divided into three ‘watches’, who take charge in rotation. They use a variant of the ‘Swedish system’, with five duty periods:

midnight–04:00, 04:00–08:00, 08:00–13:00, 13:00–19:00, 19:00–midnight.

Times are local times, and when the ship moves into a new time zone the change is always by one hour. The ship is not fast enough to have more than one time zone change in two days.

What is the longest possible off-duty time?

A 6 hours

B 7 hours

C 11 hours

D 12 hours

17 The draw has been made for this year's Middle-earth Cup, as follows:

First Round

Match 1	Harrowdale	v	Rushey
Match 2	Nardol	v	Haysend
Match 3	Upbourn	v	Bucklebury
Match 4	Staddle	v	Esgaroth
Match 5	Bree	v	Hobbiton
Match 6	Tighfield	v	Bywater
Match 7	Crickhollow	v	Underharrow
Match 8	Rivendell	v	Little Delving

Second Round

Match 9	Overhill	v	Winner of Match 5
Match 10	Winner of Match 3	v	Isengard
Match 11	Stock	v	Winner of Match 1
Match 12	Winner of Match 6	v	Edoras
Match 13	Winner of Match 2	v	Frogmorton
Match 14	Tuckborough	v	Winner of Match 7
Match 15	Michel Delving	v	Winner of Match 4
Match 16	Winner of Match 8	v	Budgeford

Third Round

Match 17	Winner of Match 15	v	Winner of Match 12
Match 18	Winner of Match 11	v	Winner of Match 9
Match 19	Winner of Match 16	v	Winner of Match 13
Match 20	Winner of Match 10	v	Winner of Match 14

Semi-Finals

Match 21	Winner of Match 18	v	Winner of Match 20
Match 22	Winner of Match 19	v	Winner of Match 17

Final

Match 23	Winner of Match 22	v	Winner of Match 21

All matches (including the Final) are to be played at the home ground of the first-named team.

Which team faces the prospect of having to play five matches all away from home in order to win this year's Middle-earth Cup?

A Esgaroth

B Hobbiton

C Rushey

D Underharrow

[Turn over

18 A fund-raising scheme involves inviting people for coffee, and getting them each to pay $1 into the community fund. Donna's decreasing plan involves inviting 5 people to the first coffee morning. Each of these 5 people then holds a coffee morning to which they each invite 4 other people. Those people then each invite 3 others to their own coffee mornings, and the process continues until there is only one person invited to each coffee morning in the last set.

How much money would this raise for the community when the scheme has finished?

A $15

B $120

C $205

D $325

19 The organisers of a conference, with delegates from Germany, China, France and Italy, wish to choose which country's style of cooking should be used for the final grand banquet. The delegates were asked to rank the countries' cuisine in order of preference. Perhaps surprisingly, all delegates from any particular country had identical preferences. The table below shows these.

	Country of origin			
	Germany	*China*	*France*	*Italy*
Number of delegates	45	25	15	15
First preference	German	Chinese	French	Italian
Second preference	Chinese	French	Italian	French
Third preference	French	Italian	Chinese	Chinese
Fourth preference	Italian	German	German	German

Using these preferences the organisers decide to compare the cooking styles two at a time. Thus, for instance, they examine whether more delegates prefer German to Italian, or Italian to German; and they do this for every pair of styles. They decide that if one style is preferred to all others in these matches, then that style will be chosen for the banquet. Otherwise, the banquet's menu will be determined by a lottery.

What style of food will be served at the banquet?

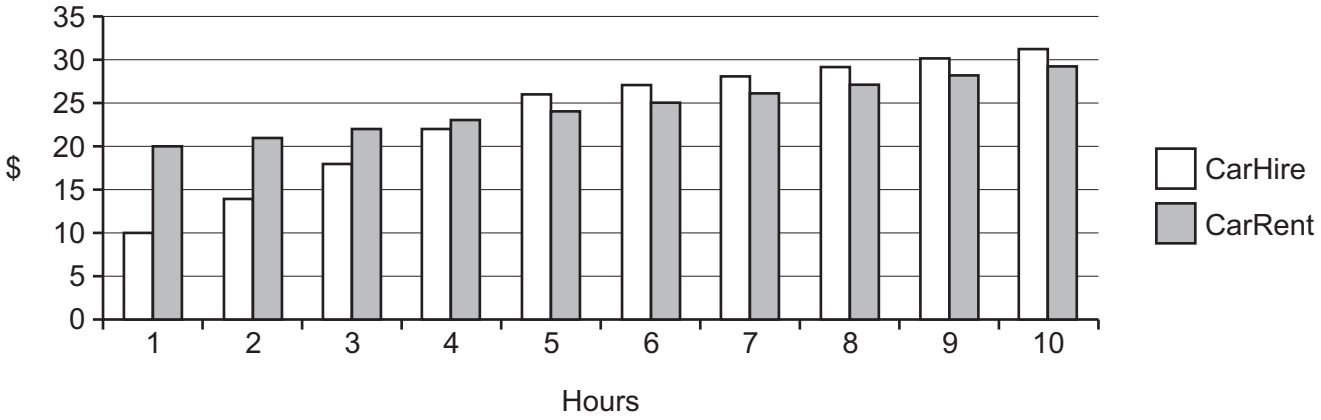
A Chinese

B French

C German

D It will be determined by a lottery

20 The price for hiring a car is calculated by taking a fixed charge for the hire of the car and then adding an amount for each full hour that it is hired for. The amount charged for each hour can be reduced after a number of hours, but this can only happen once. The maximum length of time that a car can be hired for is 10 hours. The bar chart below shows the prices to hire a car with two different companies.



Which of the following statements about the rates is **not** true?

A The fixed charge for CarRent is $10 more than the fixed charge for CarHire

B For the first five hours, CarHire charges $3 per hour more than CarRent

C For the hours after the first five, CarHire and CarRent charge the same amount

D CarRent does not reduce the charge per hour

21 The combination lock on my bag has four wheels, each with the digits 0–9. I have just bumped it, and think that I turned some or all of the wheels and so have lost the combination.

I am sure that no digit has changed by more than 2, up or down. I remember that each digit after the first was larger than the one to its immediate left. The digits showing now are 3 5 7 4.

What is the maximum number of combinations I might need to try before I succeed in opening the lock?

A 2

B 3

C 4

D 5

22 I can fit 68 DVD boxes of width 1 cm on the top shelf in my study with a gap left at the end of the shelf. I can fit 35 CD boxes on the bottom shelf in my study, with a gap left at the end that is 6 cm longer than the gap left on the top shelf.

Which additional piece of information below would, by itself, enable me to calculate the length of the top shelf?

A The difference between the lengths of the shelves

B The length of the bottom shelf

C The sum of the lengths of the two gaps

D The width of one CD box

23 Mario works every day sewing cloth dolls. He finds the work boring and tiring. The first doll he makes each day takes him 9 minutes, the next 10 minutes, the next 11 minutes and so on. This week he made the same number of dolls on Monday and Tuesday. On Wednesday and Thursday, taken together, he made the same number of dolls as on Monday and Tuesday, taken together, but he made 6 more dolls on Wednesday than he did on Thursday.

How much longer in total did Mario work on Wednesday and Thursday than he did on Monday and Tuesday?

A 0 minutes

B 3 minutes

C 6 minutes

D 9 minutes

24 Gemma is hosting a party for 12 children. She wants to give each child a bag of marbles containing 2 silver marbles and 10 blue marbles. A retailer, Ahmed, mixes together silver and blue marbles and sells them in jars. Each jar contains at least 28 and at most 30 marbles. Ahmed also makes sure that, of the marbles in each jar, at least 6 and at most 8 are silver.

How many jars of marbles does Gemma need to buy to ensure she has enough for her party?

A 4

B 5

C 6

D 7

25 Tandy went shopping for birthday presents and bought three items all costing an exact number of dollars. The total amount she spent was $14. Otherwise, all she could remember was that two of the prices added to equal the third.

Which other piece of information would certainly be sufficient for her to determine what all three prices were?

A The difference between two of the prices

B The product of two of the prices

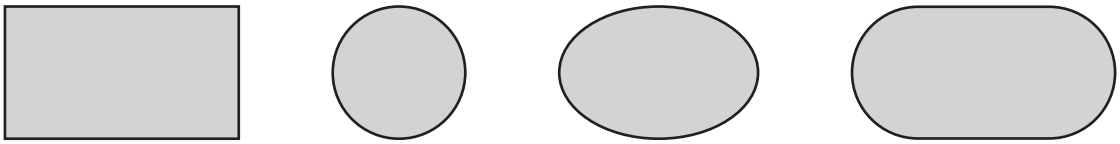
C The sum of two of the prices

D The price of the most expensive item

26 A solid cylinder falls vertically through a shed roof with a 45° slope.

Which one of the following could **not** be the shape of the resulting hole in the shed roof?

A **B** **C** **D**



27 100 candidates applied to join a company and were given two tests. Anybody who was in the top 24 in both tests was recruited. This gave fewer than 24 people. The recruiters then looked at the top 25, then the top 26 etc. until at least 24 people were in both top sections. All of these people were recruited.

Josephine thinks she did well in one test and badly in the other, but she was recruited.

What is the worst position she could possibly have been placed in one of the tests?

A 48th

B 52nd

C 62nd

D 76th

28 Derek lives in Ayton and Eric lives in Beeton. They decided to meet in Campton. The distance from Ayton to Campton is twice the distance from Beeton to Campton. Derek left Ayton and walked at a constant speed to Campton. Eric left Beeton at 12 noon and walked at a different constant speed to Campton. They arrived at Campton at the same time. Eric's journey time is ⅔ of Derek's journey time.

Which **one** of the following pieces of information is sufficient to find Derek's average walking speed from Ayton to Campton?

A The distance from Ayton to Campton

B The steady speed at which Eric walked

C The time that Derek and Eric arrive in Campton

D The time that Derek left Ayton

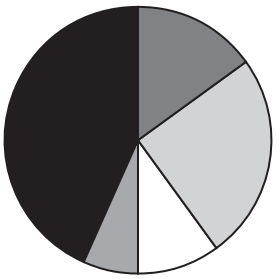
29 The results of the recent election were as shown in the table below.

Blue	Red	Yellow	Green	Black
12	20	8	5	30

After the results were announced, a further 5 votes were found.

Which of the following charts could **not** correctly show the results of the election when the extra 5 votes were included?

A



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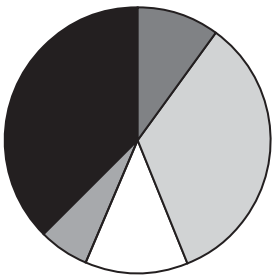
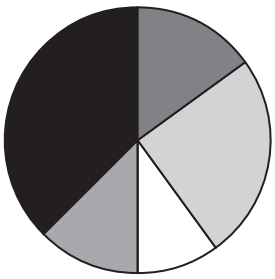
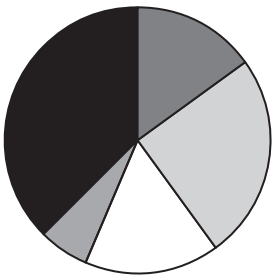


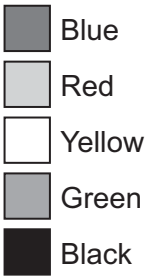
C



D



Key



30 Northbit and Southpart are villages on opposite banks of the River Tween. Every year teams from both villages take part in a tug-of-war across the river, until the losing team is pulled into the water.

25 years ago, Southpart had won exactly ¾ of the contests. However, following 16 wins in the last 25 years, Northbit have now increased their success rate to 40%.

How many times have Northbit won the tug-of-war against Southpart?

A 26

B 39

C 50

D 65

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