

BioMedical Admissions Test

4500/11

Wednesday

4th November 2009

One hour

SECTION 1 Aptitude and Skills

Instructions to Candidates

Please read this page carefully, but do not open the question paper until you are told that you may do so.

A separate answer sheet is provided for this section. Please check you have one. You also require a soft pencil and an eraser.

Please complete the answer sheet with your:

- BMAT candidate number
- centre number
- date of birth
- name

Speed as well as accuracy is important in this section. **Work quickly, or you may not finish the paper.** There are no penalties for incorrect responses, only points for correct answers, so you should attempt all 35 questions. All questions are worth one mark.

Answer on the sheet provided. Most questions ask you to show your choice between options by shading a circle. If questions ask you to write in words or numbers, be sure to write clearly in the spaces provided. If you make a mistake, erase thoroughly and try again.

Any rough work should be done on this question paper.

Calculators are NOT permitted.

Please wait to be told you may begin before turning this page.

This paper consists of 24 printed pages and 4 blank pages.

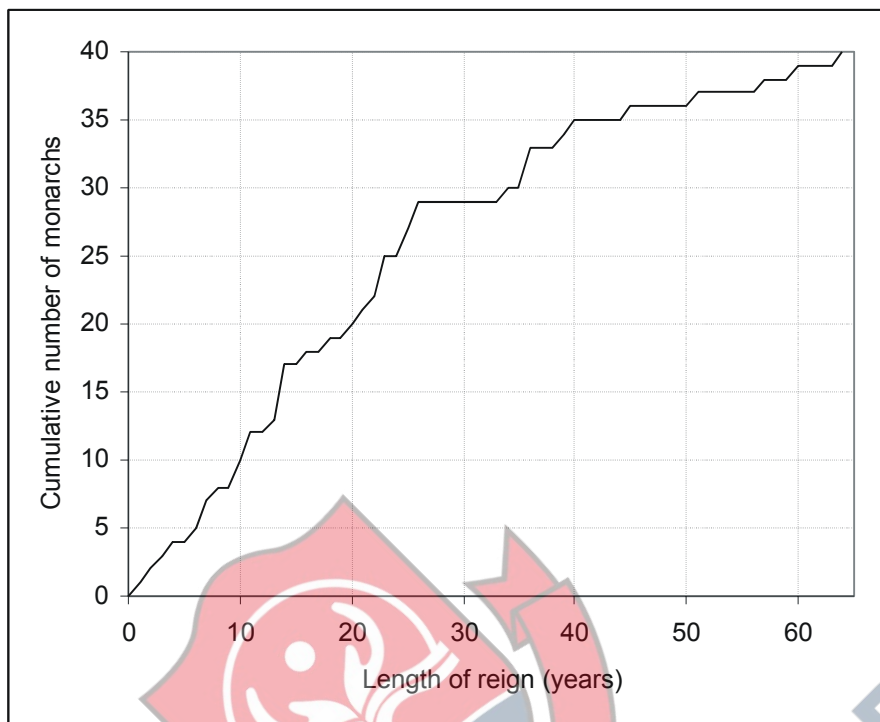


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- 1 The graph below is a cumulative plot of the length of reigns of British kings or queens from 1066 to the present. The vertical axis shows the number of monarchs who had reigned for less than the number of years plotted on the horizontal axis.



How many monarchs reigned for 20 years or more but less than 40 years?

Home vs. Hospital

Where would you rather give
birth to your baby?

Cosily by the fire - or in a hi-tech room?
One midwife to hand - or a team of experts on
standby?

By Sophie Goodchild

The news that the Health Secretary wants more women to give birth at home will outrage clinicians, but delight the natural birth lobby, who say the delivery of babies has shifted too far in favour of 'medicalisation'.

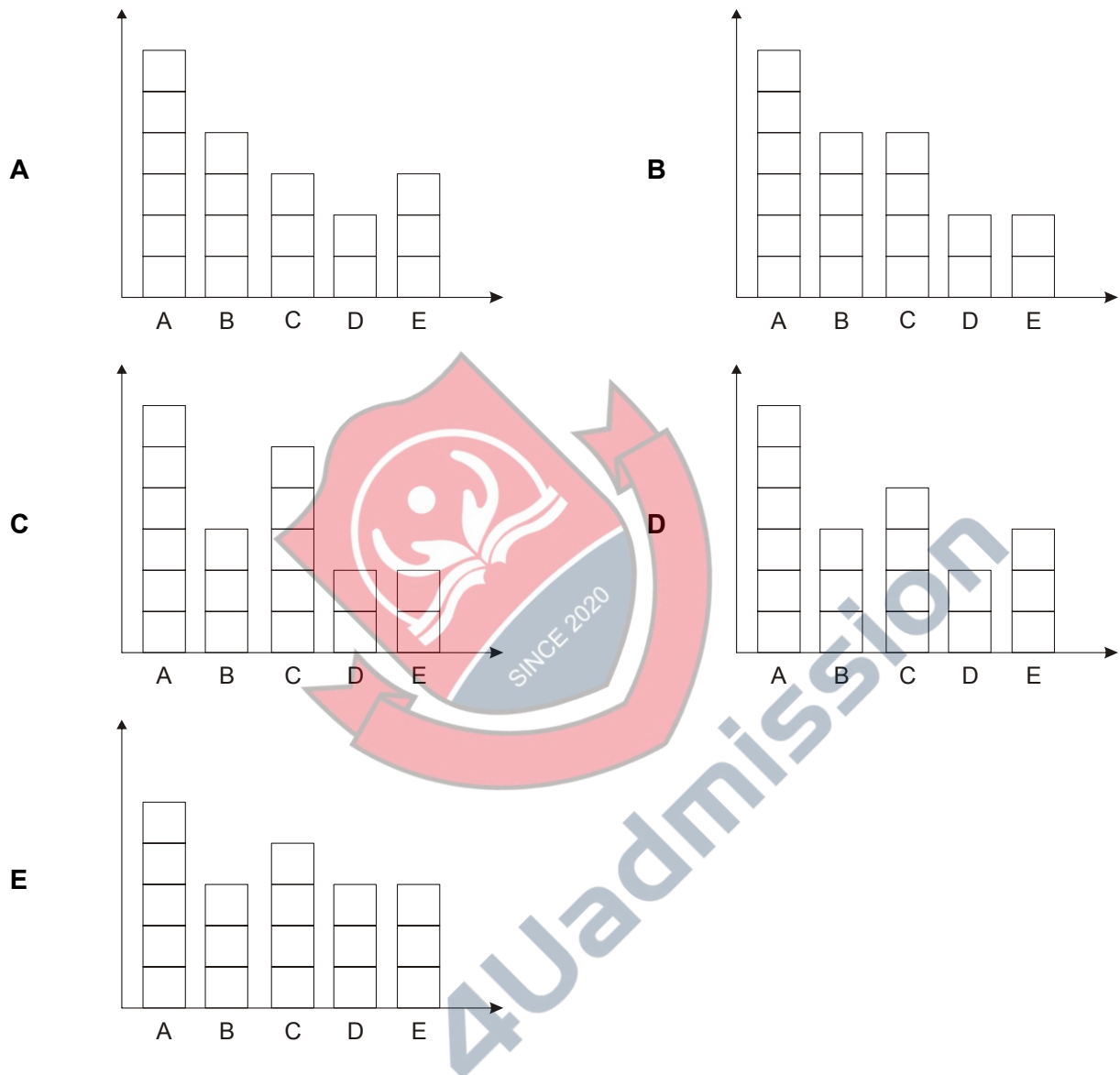
The debate amongst feminists over whether childbirth should take place away from the hi-tech environment of the labour ward or surrounded with as much pain relief and medical intervention as possible has divided women for decades.

The above issue, presented as it is, implies which one of the following?

- A** The Health Secretary is wrong to encourage women to give birth at home.
- B** The highest levels of pain relief and medical intervention are not possible away from a labour ward.
- C** Cost cutting is at the heart of the Health Secretary's enthusiasm for home births.
- D** Feminists are strongly opposed to the medicalisation of childbirth.
- E** Mothers and their babies progress better when childbirth takes place in a hospital.

- 3 I recently asked four members of my class to draw bar charts of some data that we collected. Every student managed to produce a bar chart, but they all drew exactly two bars at the wrong height on their graph. I drew the correct bar chart from the data. Unfortunately, I didn't label any of the charts so I now don't know which one is the correct one.

Which graph correctly represents the data that we collected? (All of the graphs are drawn to the same scale.)



- 4 Last winter, heavy snowfalls prompted criticism of the Government for failing to ensure that the country is prepared for severe weather. Billions of pounds were lost to businesses through workers being unable to make their journey to work during a week of heavy snowfall. Others felt that these costs should be accepted philosophically. Given that the likelihood of a prolonged period of heavy snow in the UK is very low, it could be said that the high cost of investing in preventative measures would be unreasonable. Governments have to make an assessment of the probability of the event occurring, the cost of preventative measures and the cost of the event happening. In some cases the cost of preventative measures is too high when the risk is low. The recent severe weather is one such case. One might also consider the threats of pandemics such as bird flu, or asteroids hitting the earth, both of which might be considered 'low risk but high cost.'

Which of the following best expresses the main conclusion of the argument above?

- A The Government has a responsibility to assess risks and costs of possible events.
- B The Government was right not to spend heavily on precautions against prolonged snowfall.
- C The Government should be spending more to protect us against pandemics and asteroids.
- D The Government should have spent more on precautions against prolonged snowfall.
- E The Government should compensate businesses for the billions of pounds lost during a week of snow.

- 5 On a recent train journey I was drawn into a conversation by an elderly couple who were keen to tell me all about their grandchildren.

Although proud of them all, their one complaint was the constant expense of buying birthday presents. There is at least one birthday amongst the grandchildren every calendar month, and April is particularly expensive for them because it sees the birthdays of three of the five pairs of twins.

I remember them saying that they have exactly twice as many granddaughters as grandsons, but after they had left the train I realised that they hadn't told me how many grandchildren they have in total.

Assuming that any pair of twins would share the same birthday, what is the minimum number of grandchildren they have?

- A 15
- B 18
- C 19
- D 20
- E 21
- F 24

- 6 There has been far too much fuss about the dangers of young people using the drug ecstasy. We need to get things in proportion. The use of ecstasy causes only 30 deaths per year in Britain, whereas horse riding causes 100 deaths per year. Thus campaigns over recent years to discourage young people from using ecstasy are not necessary. As the comparison with horse riding clearly shows, taking ecstasy is nowhere near as dangerous as many people believe.

Which of the following identify/identifies a weakness in the above argument?

- 1 More young people may use ecstasy if there were no campaigns about its dangers.
- 2 The argument assumes that horse riding should not be considered too dangerous.
- 3 There may be fewer young people using ecstasy than engaging in horse riding.

- A 1 only
- B 2 only
- C 3 only
- D 1 and 2 only
- E 1 and 3 only
- F 2 and 3 only
- G 1, 2 and 3

- 7 I have three choices for my membership of the local sports club. The details of the memberships are as follows:

Membership type	Membership fee per year	Times allowed	Hire of equipment
Gold	£100	All day	£0.50 per time
Silver	£80	9am – 5pm	£1 per time
Bronze	£70	9am – 5pm	£3 per time

I currently have a Bronze membership and I know the number of times that I will need to hire equipment in the coming year. I am considering changing to either Gold or Silver membership. If I did, the total cost for either would be the same.

How much can I save in the coming year by changing my membership?

- A £30
- B £40
- C £70
- D £80
- E £120

Questions 8 - 10 refer to the following information:

UNREPORTED CRIME

A survey by Lynne Featherstone

On the basis of both anecdotal and documented evidence that many crimes are not reported to the police, I undertook a survey to provide a snapshot of the level of the non-reporting of crime. In doing so I was particularly interested in why people did not report crimes to the police and what these reasons show about the level of public confidence in the police service.

Survey

The questions on the reporting of crime were included in a wider survey on crime and disorder that was sent out to residents in a single north London borough during the second half of last year.

Respondents were asked whether they had been a victim of or witness to a crime in the last year, and if they answered 'yes', whether they reported it to the police. Those who answered 'no' were asked why they did not report the crime to the police. Those who answered 'yes' were asked whether they were satisfied or not with the speed of the police response and the follow-up work by the police afterwards.

2093 replies were received, according to which the following findings were recorded:

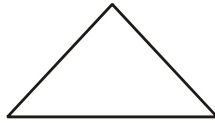
- Of those who responded, 1119 experienced or witnessed a crime in the last year (54%).
- Of these, 421 did not report the crime to the police (38%).
- Of those who did not report the crime, 215 did not do so because they lacked confidence in the police for one reason or another.
- Of those who did not report the crime, 133 did not do so because they thought the crime concerned was not important enough.
- Of those who did report it, 224 were not satisfied with the speed of the police response while 324 were not satisfied with the work of the police to follow up the report.

Base your answers on the assumption that the respondents in the survey are and remain representative of the resident population of the borough, and that they respond to questions truthfully.

- 8 If a typical resident experienced or witnessed a crime but did not report it, the probability that he or she thought it was insufficiently important would be:
- A Less than 0.25
 - B Greater than 0.25 but less than 0.33
 - C Greater than 0.33 but less than 0.5
 - D 0.5 or higher

- 9 Which of the following can reliably be inferred from the figures, and from the responses and reasons given by the residents?
- 1 If a resident who reported a crime in the past year witnesses or experiences a crime in the coming year, there is at least a 50% chance that they will not report it to the police.
 - 2 The majority of residents in the borough are dissatisfied with the police response to reported crime, and/or lack confidence in the police.
 - 3 Of those who reported a crime in the past year, over 120 gave more than one reason for saying they were dissatisfied with the police response.
- A 1 only
- B 2 only
- C 3 only
- D 1 and 2 only
- E 1 and 3 only
- F 2 and 3 only
- G None of the above
- 10 Which of the following possible explanations of why people didn't report crime would be best supported by the results of the survey?
- A failure by the police to deal with many crimes reported in previous years
- B unusually high incidence of crime in that particular part of London
- C belief among residents that most of the crimes would be drug related
- D the possibility that some of the crimes were against other criminals
- E increasing amounts of paperwork and bureaucracy in the police force
-

- 11 The Penguin Theatre Group is designing a brochure to publicise their new production. The brochure will be made from a single sheet of paper which will be folded exactly in half twice, the final shape being a right angled triangle as shown below:

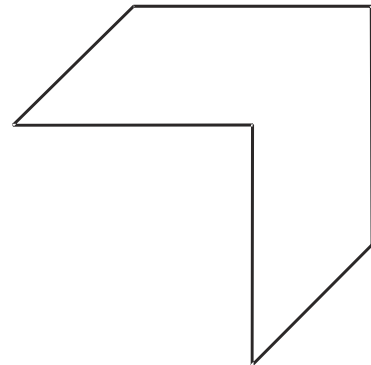


Which one of the following shapes could be the piece of paper from which the brochure is folded?

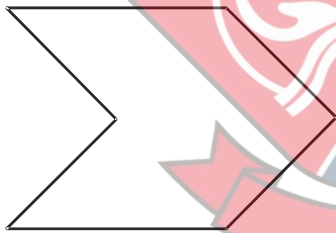
A



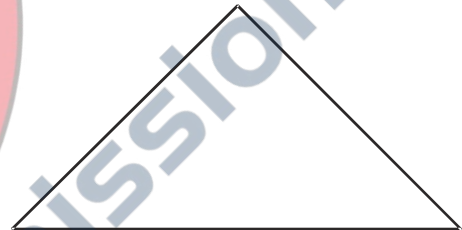
B



C



D



- 12 A magic pill that makes you slim with no side effects would be the 21st century's 'goose that laid the golden egg'. With 13 million people forecast to be obese by 2010, the market for a miracle cure is huge. Consumer groups are concerned, however, that "slimming pills" are at best expensive and useless, as they will not have any effect unless people also reduce their intake of food. At worst they can cause side effects and be addictive. People who are worried about their weight often fail to be cautious about what looks like a miracle cure. So why are manufacturers allowed to sell these pills and make grand claims for their effectiveness? Because most slimming pills are not licensed as medicines and so are not subject to strict controls: they are controlled by food regulations. The government should act now to protect people from their own ignorance, and make slimming pills subject to the same strict controls as medicines.

Which of the following, if true, most weakens the argument in the passage above?

- A People waste their money on many products besides slimming pills.
- B The government is introducing legislation for slimming pills to carry clear warning labels.
- C The demand for slimming pills is likely to grow as people get fatter.
- D Subjecting slimming pills to strict regulation would be a cost to the taxpayer.
- E Most people who take slimming pills do not also control their food intake.

- 13 I have two bags of marbles. I know that at least one of the bags contains marbles of only one colour.

I take one marble from the left hand bag, and put it into the right hand bag. I then take a marble from the right hand bag and put it into the left.

I then tip the marbles out of the right hand bag and see that half the marbles are green and half of them red.

Which two of the following statements could **not** both be true?

- 1 The left hand bag started off with more than two marbles in.
 - 2 The right hand bag started off with more than two marbles in.
 - 3 The left hand bag started off with marbles of only one colour in.
 - 4 The right hand bag started off with marbles of only one colour in.
- A 1 and 2
 - B 1 and 3
 - C 1 and 4
 - D 2 and 3
 - E 2 and 4
 - F 3 and 4

- 14 A Welsh police station has incorporated 'colour psychology' into the design of its cells with the intention of improving the success of interrogation. As well as glass doors thought to reduce claustrophobia, a particular shade of yellow has been used which is said by psychologists to have a positive, calming, mood enhancing effect. Similarly royal blue has been used, as evidence suggests that it enhances communication.

What assumption underlies the police's decision to use this colour scheme?

- A That people will be more likely to reveal the truth in interrogation if they feel more at ease.
- B That psychologists have full knowledge of what actually happens in the interrogation process.
- C That colour psychology is the best way of calming a suspect held for interrogation.
- D That it is important not to unnecessarily intimidate people held for interrogation.
- E That good interrogation technique is not as important as the environment in which is occurs.



- 15 Today is our village's fund-raising Fun Day. This is the current state of the "Treasure Hunt", in which entrants put their initials in their chosen square(s).

CP			BM		VH	LE	JS		MD
	WS	PL				TD			
	CE						OW		
		SP				DS			
	EK	AD		JS	FR		TB		
					SP		BM		
BM									OA
								AD	
	RJ	NT		GT				LE	
CP	FR				MH		RJ		

I have just paid for two squares. I will choose two squares that do not touch each other or any of the squares already taken, either horizontally, vertically or diagonally.

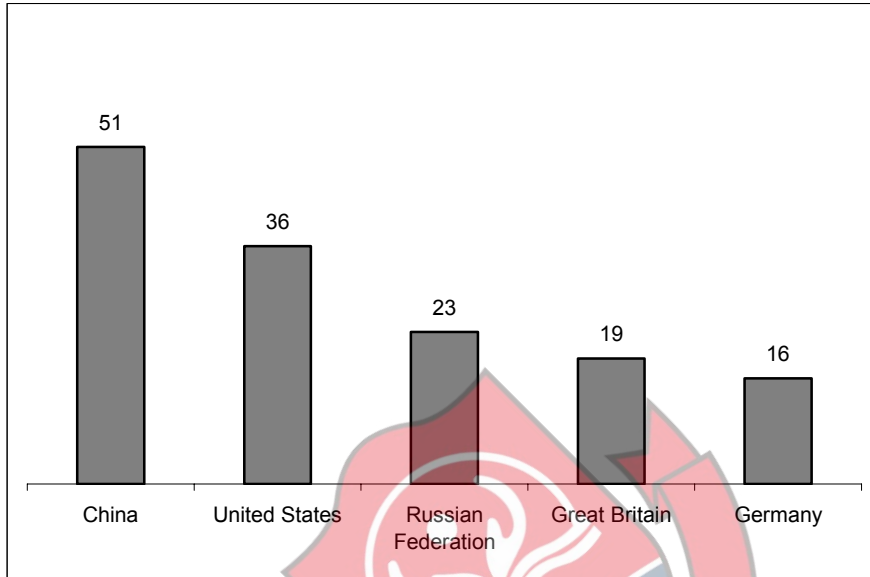
How many different pairs of squares are available to me?

- A 13
- B 14
- C 17
- D 18
- E 21

Questions 16 - 20 refer to the following information:

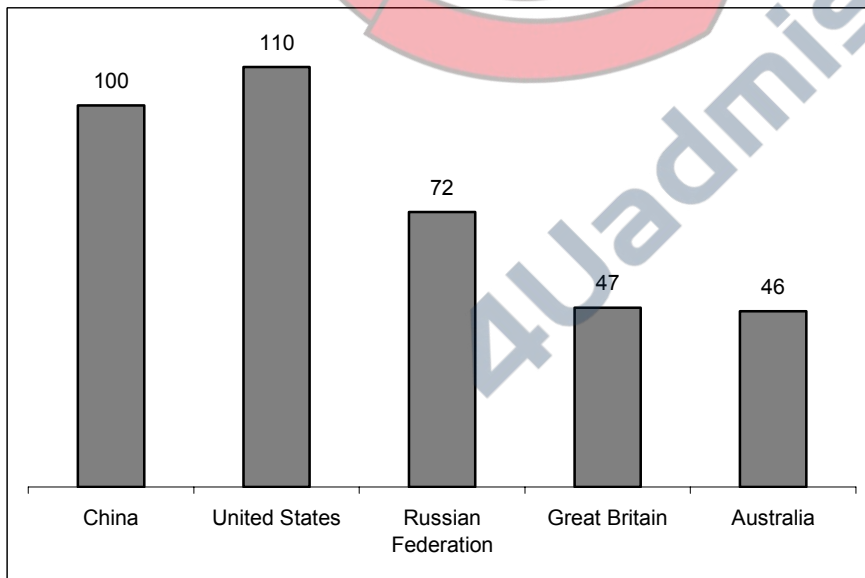
In the Beijing Olympics, in 2008, China claimed to have come out top of the medal rankings on the basis that it won the most *gold* medals.

Fig 1: Top five nations: gold medals only



The USA contested this on the grounds that it won the most medals, gold, silver and bronze counting one each.

Figure 2: Top five nations: all medals equally weighted



But arguably neither of the above methods of counting gives an accurate picture of relative achievement. The fairest system would be *weighting* the medals, as follows, and/or comparing the medals won against population or national wealth.

Fig 3: Medals weighted: gold 3, silver 2, bronze 1

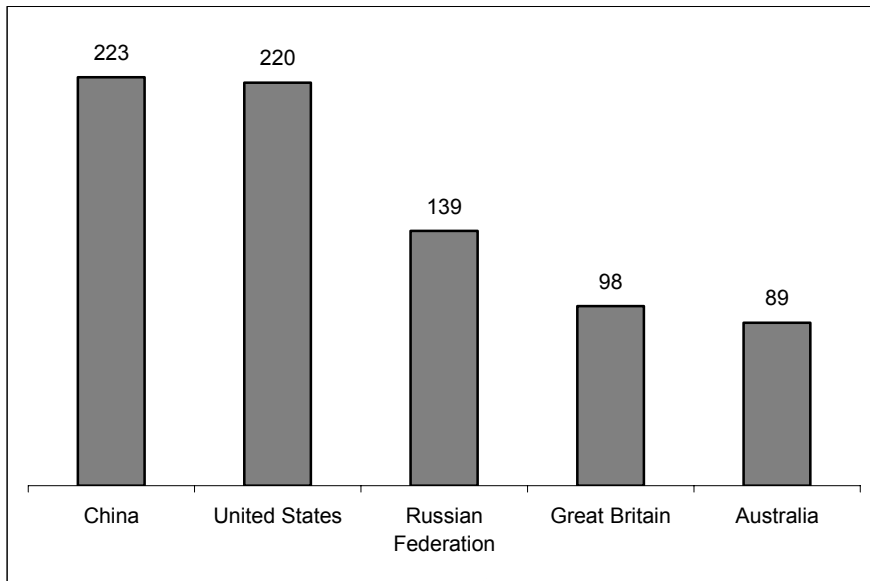
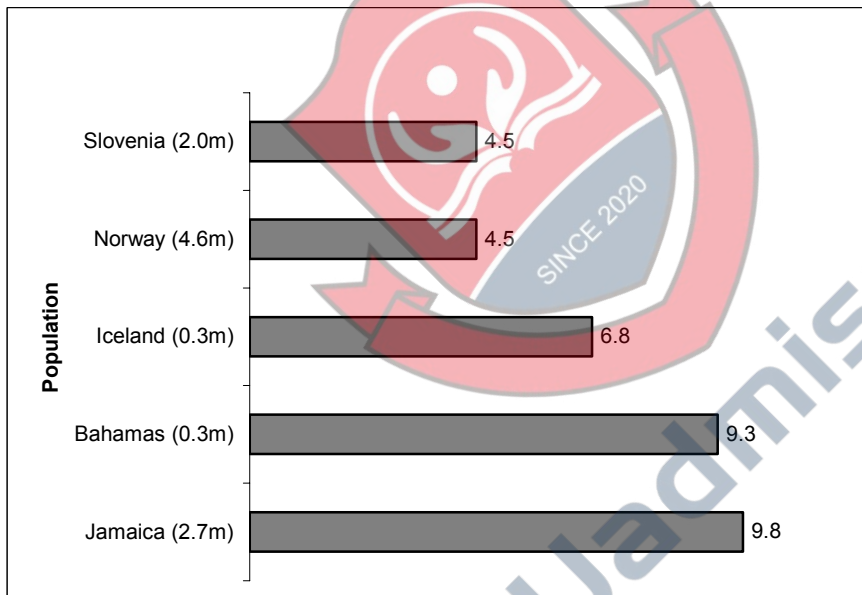


Fig 4: Medals weighted (gold 3, silver 2, bronze 1) per million population



16 How many silver and bronze medals respectively did the USA win in the 2008 Olympics?

17 Using the information given, what was the minimum number of silver medals that could have been won by Australia?

- 18** Great Britain came 4th in the ranking on all three methods of counting (figs 1 - 3). If the ranking had been based on the proportion of gold medals to all medals, among China, the USA, the Russian Federation and Great Britain, where would Great Britain have ranked?

- A** 1st
- B** 2nd
- C** 3rd
- D** 4th

- 19** Which of the following is/are *possible* given the data in Fig 4?

In the 2008 Olympics:

- 1** Norway won 3 gold and 5 silver medals.
- 2** Iceland won 3 medals.
- 3** Slovenia won 6 medals, including one gold.

- A** 1 only
- B** 2 only
- C** 3 only
- D** 1 and 2 only
- E** 2 and 3 only
- F** 1 and 3 only
- G** 1, 2 and 3

- 20** Great Britain's population is 62 million, the population of the US is 306 million, and the population of the Russian Federation is 142 million.

If these countries had been added to Fig 4, which of the following would be correct:

- 1** Great Britain rank below Slovenia but above the USA.
- 2** The Russian Federation won the equivalent of less than 1 bronze medal for every million of its population.

- A** 1 only
- B** 2 only
- C** both 1 and 2
- D** neither 1 nor 2

- 21** Maria, a malnourished patient has a regime which requires her to take a drink with her meal at lunchtime which contains 4.0 Joules in 500ml of solution. The drink is made up by adding a powdered energy supplement to water. The supplement contains 2.0 Joules per 100g powder. The change in volume of the water on adding the supplement is negligible.

Nurse Delgado has, left over from made up drinks from other patients, 200ml of drink containing the same supplement which has an energy value of 1.5 Joules and 400ml with an energy value of 2.0 Joules.

If she adds 300ml of the second drink to the first to make it up to 500ml, how much of the supplement powder must she add to make Maria's drink the correct strength?

- 22** Praise is an expression of recognition and a conferment of status. Recognition and status are important factors in our self esteem and well being. No matter how well paid someone is, if their efforts are never acknowledged the cash will not quite compensate. By the same token, someone who feels recognised and appreciated will cheerfully put up with other inconveniences, including a less desirable income. The most valuable kind of praise is that which the recipient knows to be appropriate. Praise should only be given to the extent that it is deserved.

Which of the following are assumptions of the argument in the passage above?

- 1** People can accurately assess the recognition they deserve.
 - 2** People who give praise can assess the level of praise which is deserved.
 - 3** Promoting others' self esteem is a duty which we all share.
 - 4** Self esteem produces behaviour which benefits others as well as the individual.
- A** 1 and 2 only
- B** 1 and 3 only
- C** 1 and 4 only
- D** 2 and 3 only
- E** 2 and 4 only
- F** 3 and 4 only

- 23** Each blood sample taken at a particular private clinic is given an 8-digit reference number.

Example: 12404360

This was the reference number of the 36th sample taken on 4th September 1993 (124 means the 124th month of operation of the clinic, since opening in June 1983 month 001). The final digit is a security check digit, and has the value that makes the sum of the eight digits a multiple of ten.

Which one of these reference numbers could **not** have been assigned to a blood sample taken at this clinic?

- A** 25431438
- B** 26431437
- C** 27431436
- D** 28431435
- E** 29431434

- 24** A campaign poster on public transport vehicles recently announced that 40% of teenage girls below the age of 16 who become pregnant were found to have been under the influence of alcohol at the time they had sexual intercourse.

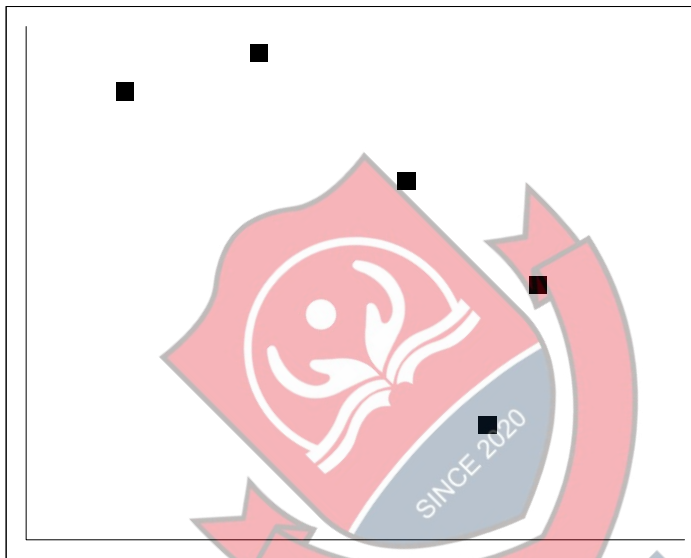
Which of the following can reliably be inferred from the above statistic?

- 1** Young people who are underage drinkers are more likely to be sexually active than those who do not drink.
 - 2** If there were stricter controls on the sale of alcohol to young people there would be fewer teenage pregnancies.
 - 3** At least 40% of girls have consumed alcohol by the age of 16.
- A** 1 and 2 only
 - B** 1 and 3 only
 - C** 2 and 3 only
 - D** 1, 2 and 3
 - E** None of the above

25 The table below summarises GCSE results for five schools in a town.

	Number taking GCSE	% achieving 5 or more A* to C grades	Number with special educational needs	Absenteeism rate (%)
Casterford	202	56	44	8.3
Shelley	61	18	12	8.8
Castle	87	40	12	9.1
Greendale	119	76	11	7.4
St.Cuthbert's	141	70	9	6.6

A graph has been drawn which summarises this data but the graph has not yet been scaled or labelled.



Which of the following could be shown on each axis?

	X axis	Y axis
A	Absenteeism rate	Percentage achieving 5 or more A* to C grades
B	Number of pupils	Percentage achieving 5 or more A* to C grades
C	Number of pupils	Absenteeism rate
D	Number with special educational needs	Absenteeism rate

- 26** Although it has been known for some time that ants are able to make alarm calls using sound, advances in technology have enabled scientists to discover that ants routinely “talk” to each other in their nests. Using miniaturised microphones and speakers that can be inserted unobtrusively into nests, researchers established that ants have a vocabulary and can talk to each other by rubbing parts of their abdomen together, and the queens can issue instructions to their workers.

But these surprising abilities can be exploited by other parasitic insects, who can mimic the ants to make them their slaves. Rebel’s large blue butterfly – an endangered species – is a case in point. This species has been found to have learnt to imitate the ants’ sounds so successfully that the butterfly’s caterpillars are carried by ants into the nests where they beg for food and are fed by the worker ants. When a colony is disturbed the ants will rescue the caterpillars before their own broods. They will even slaughter their own young to feed the caterpillars when food is scarce.

Which of the following can be drawn as a conclusion from the passage above?

- A** Ants’ abilities to make sounds will eventually lead to their extinction as a species.
- B** Rebel’s large blue butterfly is the most notable species to exploit ant colonies.
- C** Ants are unusual in displaying lack of loyalty to their own young.
- D** Ants have developed abilities to talk to each other in response to threats from parasites.
- E** The role of sounds in an ant colony could aid the survival of some species.

- 27** Tim works each day from Monday to Friday. At 5pm each day at work Tim receives 7 tokens. At 1pm on any day at work Tim can exchange a certain number of these tokens for a free meal (which always costs the same number of tokens).

On the morning of Monday 1st Tim had 20 tokens. He will take a free lunch on any day that he has enough tokens. The first day that Tim cannot get a free meal is Tuesday 9th.

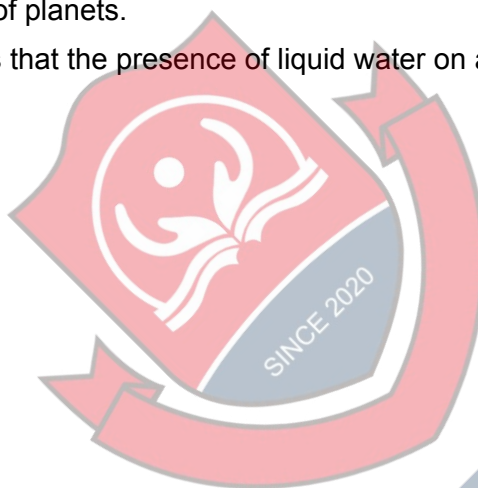
What day of the week will it be on the second time that Tim cannot get a free meal?

- A** Monday
- B** Tuesday
- C** Wednesday
- D** Thursday
- E** Friday

- 28 For there to be life elsewhere in the universe, there would have to be planets similar to Earth, i.e. small, rocky planets orbiting at the right distance from their star to ensure that they are not so hot that water boils and not so cold that it remains frozen. Until now techniques have not been sensitive enough to detect such planets. The new Kepler telescope is so sensitive that for the first time astronomers will be able to see if there are Earth-sized planets in the 'habitable zone' of their stars - the region where the temperature is right for liquid water to exist at the surface. So if the Kepler telescope finds that such planets exist, we can at last be confident that there is life on planets other than Earth.

Which of the following is the best statement of the flaw in the above argument?

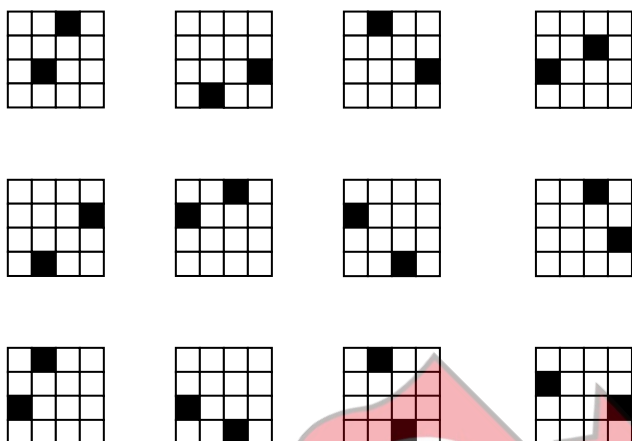
- A It assumes that Earth-sized planets will have life forms similar to those on Earth.
- B It assumes that the existence of Earth-sized planets in the 'habitable zone' is sufficient for life to exist.
- C It assumes that the Kepler telescope will find Earth-sized planets in the 'habitable zone' of their stars.
- D It assumes that it is necessary to have highly sensitive equipment to detect the existence of planets.
- E It assumes that the presence of liquid water on a planet is not sufficient for life to exist.



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- 29 A particular company manufactures square floor tiles whose patterns consist of 16 smaller squares of equal size. Two of the smaller square on each tile are black, whilst the rest are white.

When I opened a packet of 12 of these tiles this morning and laid them out as shown below, I thought that they were all different.



On closer inspection, however, I realised that rotation of the relevant tiles would reveal that some are identical to at least one of the others.

How many **different** patterns are there in my packet of 12 tiles?

- A 4
- B 5
- C 6
- D 7
- E 8
- F 9

- 30** It is human nature to try to explain what we observe occurring around us, a process that people engaged in long before physical, biological or social sciences were established as disciplines. The difference between 'common sense' explanations and scientific ones lies in the way the two originate. Everyday observations are haphazard, careless and not systematic, whereas those carried out by scientists endeavour to be specific, objective, well focused and systematic, to the extent that they could be replicated by someone else. While there are few true guarantees, the more systematic and organised the studies we conduct, the more likely they will produce valid explanations that can be used to support decisions.

Which of the following best expresses the conclusion of the passage above?

- A** Decisions should not be based on common sense explanations.
- B** Human nature has long preferred informal observation to scientific study.
- C** The best scientists are those who discount all common sense explanations.
- D** Common sense explanations are less likely to be valid than those based on scientific enquiry.
- E** Scientific explanations often support and substantiate common sense explanations.

- 31** One algorithm for controlling the order in which floors are visited for a lift is called SST or "shortest seek time first". It keeps a list of all the floors it is currently requested to visit and, after a stop, it will next visit the closest on its list. If two requests are the same distance away, it goes in the direction in which more floors have requested the lift.

A lift using SST has just stopped at floor 7 and its request list contains floors 0, 4, 10, 14 and 16. Just after it starts moving, a new request comes in for floor 7.

If no further requests come in, how many stops will it make before it reaches floor 16?

- A** 2
- B** 3
- C** 4
- D** 5
- E** 6

Questions 32 - 35 refer to the following information:

The table below shows the value of the Scottish agricultural production in four sectors from 1994 to 1998.

Scottish agricultural output 1994-1998

	<i>£ million</i>	1994	1995	1996	1997	1998
Farm crops	cereals	320.0	423.3	431.9	339.6	295.8
	potatoes	119.7	229.1	120.7	81.2	117.1
	oilseed rape	59.6	50.3	52.8	46.5	53.8
	other	4.7	4.2	5.0	5.5	5.9
	total	504.0	706.9	610.4	472.8	472.6
Horticulture	vegetables	30.0	35.4	43.3	34.5	38.3
	fruit	11.9	13.3	16.0	18.8	20.4
	flowers etc	32.6	35.0	32.6	33.3	36.3
	total	74.5	83.7	91.9	86.6	95.0
Livestock	cattle	508.2	557.6	538.2	490.4	439.7
	sheep	244.0	273.7	255.7	245.1	237.4
	pigs	67.7	79.2	94.2	89.9	70.2
	poultry	104.5	106.0	120.1	115.2	90.8
	other	17.8	19.6	25.3	27.4	19.6
	total	942.2	1036.1	1033.5	968.0	857.7
Products	milk	285.7	291.5	300.6	268.4	236.2
	eggs	27.1	26.4	28.1	26.9	25.6
	wool	9.9	9.9	9.7	7.7	7.4
	other	3.9	3.4	2.9	3.5	4.2
	total	326.6	331.2	341.3	306.5	273.4

<http://www.scotland.gov.uk/deleted/library/documents-w10/ersa-04.htm>

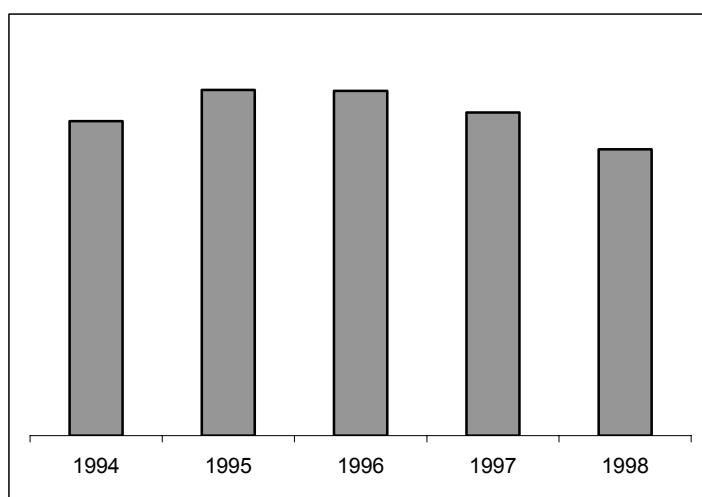
Commentary on 1998 figures

Largely as a result of the strength of the pound at the time, lower prices were experienced due to farmers having to drop their prices for commodities being exported from the UK. Although prices dropped for some inputs, such as fertiliser and animal feed (again as a consequence of the strength of the pound) this was not enough to prevent farming income experiencing a sharp fall. Scottish farm incomes are still above those experienced in 1980, 1985 and 1986.

32 Which of the following items showed the biggest percentage change (up or down) from 1997 to 1998?

- A** Cattle
- B** Pigs
- C** Potatoes
- D** Wool
- E** Vegetables

33 The vertical scale of the following graph has been omitted, which sector does it show?



- A Farm crops
- B Horticulture
- C Livestock
- D Produce

34 Which of the following can safely be concluded from the data given in the table and the commentary?

- A Following a fall in income in 1997, some horticulturists changed production from vegetables to flowers.
- B The price of pigs has risen relative to that of cattle over the period shown.
- C The pound was even stronger in the 1980s than it was in 1998.
- D If volumes of production have not changed a higher percentage of farm crops than horticulture must be sold overseas.
- E Potatoes are the crop of which the highest proportion is exported.

35 If the pound fell by 5% in 1998 and the drop in value of sheep was entirely due to this, approximately what percentage of sheep is exported?

- A 3%
- B 5%
- C 8%
- D 37%
- E 63%

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