THINKING SKILLS ASSESSMENT (TSA)
TEST SPECIFICATION

2017

Test Format

The TSA is an assessment of two kinds of thinking:

Critical Thinking - reasoning using everyday written language.
The skill of Critical Thinking is basic to any academic study and often involves considering an argument put forward to promote or defend a particular point of view.

Problem Solving - reasoning using numerical and spatial skills.
Many of the problems encountered in academic and professional work are novel. No ready 'off the peg solution' is available. The task is to find or create a solution.

In the case of the Critical Thinking questions the stimulus is a passage of text.

In Problem Solving questions the stimulus may include a diagram, a table of information, or a graph.
The multiple-choice options may also be graphs or diagrams.

For a list of the numerical skills required for Problem Solving questions please see the appendix at the end of this document.

All questions have five multiple-choice options, of which one is correct.

Critical Thinking and Problem Solving questions are mixed throughout the test so that candidates who do not finish the test will have seen a similar number of each type of question.

Scoring

Critical Thinking and Problem Solving
All questions are worth one mark. Marks are not deducted for incorrect answers, so candidates are advised to answer all questions.

Total raw scores are converted to scores on the TSA scale, which runs roughly from 0 to 100, but which varies to take into account the overall difficulty of the questions included in a test. The use of this scale allows the scores of candidates who have taken different versions of the test to be directly compared.

An overall score is reported, together with separate scores for Critical Thinking and Problem Solving.

Level of Difficulty

The level of difficulty of the questions will be targeted to discriminate effectively between applicants.

Critical Thinking

Critical Thinking involves reasoning using everyday written language. Questions focus on the skills involved in understanding and evaluating arguments. These include: drawing and summarising conclusions, identifying assumptions and reasoning errors, assessing the impact of additional evidence, matching arguments and applying principles.

Summarising the Main Conclusion

In this type of question you have to judge which one of the statements A to E best expresses the main conclusion of the argument. So the first important step is to read the passage carefully and pick out the sentence which is the conclusion. Remember that the conclusion can appear anywhere within an argument - not necessarily at the end. Remember also that what you are looking for is the statement which follows from or is supported by the rest of the passage.

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1   Vegetarian food can be healthier than a traditional diet. Research has shown that vegetarians are less likely to suffer from heart disease and obesity than meat eaters. Concern has been expressed that vegetarians do not get enough protein in their diet but it has been demonstrated that, by selecting foods carefully, vegetarians are able to amply meet their needs in this respect.

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

A   A vegetarian diet can be better for health than a traditional diet.

B   Adequate protein is available from a vegetarian diet.

C   A traditional diet is very high in protein.

D   A balanced diet is more important for health than any particular food.

E   Vegetarians are unlikely to suffer from heart disease and obesity.

Sometimes a passage may have an intermediate conclusion which is just one of the steps in the reasoning towards the main conclusion. Be careful to check this. If a sentence appears to be a conclusion, but is used as a reason to support some other statement in the passage, then it will not be the main conclusion. Do not worry about whether the information in the passage is true. Just ask yourself "If these reasons were true, would they give me good reason to accept the sentence I have identified as the main conclusion?"

What does this argument seem to be trying to get you to accept? It seems to be trying to persuade you that vegetarian food can be healthier than a traditional diet (the first sentence). If you think this is the main conclusion, you should then check whether the rest of the passage gives you reason to believe this. Two reasons are given:

1. Vegetarians are less likely to suffer from heart disease and obesity than meat eaters.

2. A vegetarian diet can contain sufficient protein.

You may not know whether these reasons are true, but if they were true, they would indicate that vegetarian food is healthier in one respect than a diet which includes meat, and that a vegetarian diet does not necessarily have the disadvantage to health (providing insufficient protein) which some may think. So it seems clear that the first sentence of the passage is being offered as a conclusion. **A** is the correct answer.

You can use this approach to analysing arguments (identifying reasons and their relationship to the main conclusion) when approaching all types of Understanding Argument questions.

Drawing a Conclusion

In this type of question you are asked which conclusion follows from the information given. You need to consider each of the statements A to E, and to think about whether the information in the passage gives you good reasons to accept the statement.

> **2** The demand for blood donors is increasing all over the world. In Western countries, in particular, demand has been rising so rapidly that shortages have begun to appear. In all such countries, demand is growing much faster than rates of growth in populations aged 18-65 from whom donors are drawn. And, despite a massive research effort to find alternatives, it remains true that in medicine there is no substitute for human blood.
>
> Which one of the following conclusions can be drawn from the passage?
>
> **A** As the demand for blood has increased, so has the supply fallen.
>
> **B** The rate of growth of the blood-donor population has been slowing recently.
>
> **C** The increase in the rate of demand for blood is mainly due to population growth.
>
> **D** If more blood donors could be found, there would be no need to find a substitute for human blood.
>
> **E** The problem of the increase in demand for blood shows no sign of disappearing.

When you are asked which conclusion follows, you need to consider each of the statements **A** to **E**, and to think about whether the information in the passage gives you good reasons to accept the statement.

The answer to this question is **E**, because the passage makes it clear that demand for blood is growing, and there is still no substitute available.

A does not follow from the passage, because although it states that supply has not kept pace with demand, it does not state that the supply has fallen.

B does not follow from the passage, because the passage does not give any specific information about the rate of growth of the blood donor population, apart from stating that it has not kept pace with demand.

C does not follow from the passage; it does not make any claims about the general rate of population growth.

D does not follow from the passage, because although it may be true, it is not of direct relevance to the argument.

Identifying an Assumption

Questions of this type ask you to identify an assumption in an argument. An assumption is something which is not stated in the argument, but which is taken for granted in order to draw the conclusion. So you need first to identify the conclusion of the argument. Then look for the reasoning it gives to support this conclusion, and think about any important point which is not actually stated in the reasoning.

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3   A government study suggested that courses in adult education should be subsidised because they contribute to the economy, raise skills and improve job opportunities. However where an adult education course is purely for leisure there is no case for subsidy. Therefore subsidies for courses which are purely for leisure should be abandoned.

Which **one** of the following is an underlying assumption of the above argument?

A   Unemployment figures are showing an upward trend.

B   Large numbers of adults will attend these courses.

C   There are enough teachers for the courses which would be subsidised.

D   Adults attending these courses will be able to upgrade their jobs if they pass the examinations.

E   Courses which are purely for leisure cannot be economically useful.

This question asks you to identify what must be assumed in order for the conclusion to be valid. Although options **A**, **B** and **C** may seem plausible, they are of little relevance to the argument. Whilst option **D** might be true, it does not have to be assumed, because the argument is based on the study's evidence of the benefits of adult education. It is **E**, *courses which are purely for leisure cannot be economically useful*, that must be assumed if the argument is to conclude that such courses should not be subsidised.

Assessing the Impact of Additional Evidence

This type of question will typically ask you to consider what would weaken or strengthen an argument. You need first to be clear about what the argument is trying to establish. Work out what the conclusion is, and then consider what effect each of the possible answers would have on the conclusion.

4　Polar bears in captivity frequently engage in obsessive patterns of behaviour, pacing back and forth on the same spot, swinging their heads from side to side, and other signs of stress. They do this even when their living areas are quite spacious. What this shows is that conditions of captivity are not a satisfactory substitute for the natural environment of the polar bear species.

Which of the following, if true, would most weaken the above argument?

A　Polar bears are especially ill-suited to a life in captivity.

B　Many polar bears in the wild engage in obsessive patterns of behaviour.

C　Polar bears in captivity are much better fed than those living in the wild.

D　Polar bears in the wild cover many miles a day when they are hunting for food.

E　Polar bears which have been reared in captivity are incapable of surviving in the wild.

Here you are asked to consider what would weaken the argument, so you need first to be clear about what the argument is trying to establish. Work out what the conclusion is, then consider what effect each of the possible answers would have on the conclusion.

The answer is **B**. The conclusion of the argument is that the obsessive behaviour of polar bears in zoos shows that conditions of captivity are not a satisfactory substitute for the polar bear's natural environment. But if **B** is true, that is, if polar bears in the wild behave in the same way as those in captivity, then the behaviour of those in captivity cannot be taken as good evidence that the conditions of captivity are unsatisfactory.

A does not weaken the argument. If polar bears are ill-suited to a life in captivity, it follows that captivity is not a satisfactory substitute for their natural environment. So **A** strengthens the argument.

C does not weaken the argument, even though it suggests that polar bears might be better off in one respect in captivity (i.e., better fed). Captivity might nevertheless lead to stress which is not suffered by polar bears in the wild.

D does not weaken the argument, because even if polar bears cover many miles per day in the wild, pacing around in captivity may not be a satisfactory substitute for this freedom to roam.

E does not weaken the argument, because the conclusion is about the best environment for the polar bear species. Information about the best environment for those polar bears which have been reared in captivity cannot weaken this general conclusion about the species as a whole.

Detecting Reasoning Errors

This type of question asks you to identify the flaw in the argument, which means that you must identify why the conclusion does not follow from the reasons that are given. So you need to be clear about what the conclusion is, and what reasons are meant to support it.

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5   Some recent films have been very expensive to make, but have not been the big box-office hits that would have justified the expense. At the same time, there have been films made very cheaply which have been received with both huge critical and popular acclaim. Indeed, some directors who have made successful low-budget films have gone on to make unsuccessful but expensive films. It is obvious then that if directors want to make popular films, they should stick to low budgets.

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

A   Critics are often wrong in their predictions about the popularity of films.

B   The cost of making a film is normally greater than its original budget.

C   The cost of a film need not be the factor that determines its popularity.

D   The popularity of a film would justify a high level of expense in making it.

E   The public does not necessarily know whether a film has been expensive or cheap to make.

You are asked to identify the flaw in the argument, which means that you must identify why the conclusion does not follow from the reasons which are given. So you need to be clear about what the conclusion is, and what reasons are meant to support it. Ask yourself what is the main point which the argument is trying to establish, and how it tries to establish it.

The answer is **C**. The argument draws the conclusion that if directors want to make popular films, they should stick to low budgets. The reasoning offered in support of this is that:
(i) some recent films have been very expensive to make, but have not been successful enough to justify the expense;
(ii) there have been films made very cheaply that have been very popular; and
(iii) some directors who have made successful low-budget films have gone on to make unsuccessful but expensive films.

But the conclusion does not follow, because the argument fails to establish a causal link between the cost of making a film and its popularity; it fails to consider high budget films that have been popular and low budget films that have been unpopular. **C** is the statement which best explains this.

A does not describe the flaw, because it simply states something that may be true, but is of little relevance to the argument.

B does not describe the flaw, because the argument does not depend upon a comparison of original and final budgets.

D does not describe the flaw, but states something that may be true but, if anything, contradicts the conclusion of the argument.

E does not describe the flaw, because it simply states something that may be true, but is not relied upon by the argument when reaching the conclusion.

Matching Arguments

This type of question asks you about similarity between arguments, but not the sort of similarity where two arguments are about the same topic. The similarity you are looking for is in the *structure* or the *pattern* of the argument.

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6   I cannot get any answer when I dial my mother's home phone. Either she is not answering her phone or she has decided to stay away on holiday for an extra week. She must still be away. She would never let the phone ring without answering it.

     Which of the following most closely parallels the reasoning used in the above argument?

     A   If I want to remain fit and healthy I have to watch my diet and take exercise. I want to stay fit so I eat carefully and go running regularly.

     B   If Zara had carried on going to the gym and eating sensibly, she would never have got so run down. She did get run down, so she must either have given up her diet or stopped going to the gym.

     C   Adam is looking a lot fitter. Either he has cut down on his eating or he has been out running every day. I know for a fact that Adam couldn't keep to a diet, so it must be exercise that's done it.

     D   Anyone who swims over twenty lengths a day has to be pretty fit. Alya swims thirty lengths a day. Therefore Alya must be quite fit.

     E   Keeping to a diet is hard at first but after about two weeks most people get used to it. I have been dieting for nearly two weeks so I should be getting used to it soon.

As a first step to finding the structure, look at the passage to see if there are repeated statements which you could represent with a letter (e.g. X or Y). It is slightly difficult to do that in this argument, because the repeated statements are worded in a slightly different form each time. But we can see that there are two important ideas which are mentioned twice:

My mother is (must be) away
My mother is not answering the phone (is letting the phone ring without answering it)

If we replace these statements with X and Y, we can see the following structure.
Either X is true or Y is true.

Y cannot be true
So X must be true

X = my mother is away
Y = my mother is letting the phone ring without answering it

We now have to look for the argument which has this same structure.

C is the answer. In this case X = Adam is exercising, Y = Adam is dieting and the structure is the same:
Either X (Adam is exercising) or Y (Adam is dieting)
Y (Adam is dieting) cannot be true. So X (Adam is exercising) must be true

A has a different structure:
If I want X, I have to do Y.

I want X.
So I do Y.
X = remain fit (and healthy)
Y = watch my diet and take exercise

B has a different structure:
If X and Y had happened, Z would not have happened. Z did happen.

7

So either X didn't happen or Y didn't happen
X = Zara going to gym
Y = Zara eating sensibly
Z = Zara getting run down.

D has a different structure:
All people who do X are Y
Alya does X
Therefore Alya is Y
X = swim over 20 lengths a day
Y = fit

E has a different structure:
Most people who do X, succeed in Y
I have done X
So I should succeed in Y
X = stick to a diet for 2 weeks
Y = getting used to the diet

Applying Principles

In this type of question you are asked which statement illustrates the principle underlying the passage. A principle is a general recommendation, which, in the passage, will be applied to just one particular case, but which could also be applied to other cases. In order to answer this type of question, you must first identify this principle and then consider each of the answer options to see which one follows from that principle.

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7 Smokers who suffer from heart disease which is caused by their smoking should not be allowed to get free health treatment. That is because this is an example of self-inflicted illness. Those whose actions have caused illness or injury to themselves should make a financial contribution to their treatment.

Which one of the following best illustrates the principle underlying the argument above?

A Children should get free dental treatment, even if they eat sweets which cause dental decay.

B Heart disease sufferers who can afford to pay for health treatment should not receive free treatment.

C Smokers who cannot afford to pay for health care should be allowed free treatment when they are ill.

D People who are injured in car accidents should receive free treatment regardless of whether they were wearing a seat belt.

E Motor cyclists whose head injuries are caused by not wearing a crash helmet should make a financial contribution to their treatment.

When you are asked which statement illustrates the principle underlying the passage, you must first identify this principle. A principle is a general recommendation, which, in the passage, will be applied to just one particular case, but which could also be applied to other cases. For example, someone might use the principle "Killing is wrong" in order to argue for pacifism, i.e. for refusing to go to war. If we are to accept the principle that killing is wrong, then it also follows that capital punishment is wrong, and even that killing in self-defence is wrong.

In order to answer this type of question, you first need to understand the argument, so look for the conclusion, and for the reasons, in the usual way. This should enable you to see what principle the argument relies on in order to draw its conclusion. You then need to consider each possible answer to see which one follows from the principle.

The conclusion of this argument is that smokers who get heart disease as a result of smoking should not get free health treatment. The reason given for this is that their illness is self-inflicted. This reasoning relies on the general principle that if your actions have caused your illness or injury, you should make a financial contribution to your treatment.

The correct answer is **E**, which applies the principle to motor cyclists whose failure to wear a crash helmet has caused their head injuries.

A is not an application of the principle, because it suggests that even if a child's actions (eating sweets) have caused a health problem (dental decay), the child should nevertheless have free treatment.

B is not an application of the principle, because it makes a recommendation based on people's ability to pay for treatment, rather than on whether their actions have caused their illness.

C is not an application of the principle, because, like **B**, it makes its recommendation solely on the ability to pay.

D is not an application of the principle because it recommends free treatment regardless of whether people's actions have contributed to their injuries.

Problem Solving

Problem Solving involves reasoning using numerical and spatial skills. Questions are of three kinds, each assessing a key aspect of insight into unfamiliar problems. The three kinds are Relevant Selection, Finding Procedures, and Identifying Similarity. Although most questions fall into one category, some questions fit into more than one of the categories.

Relevant Selection

Very often a real world problem will be overloaded with information, much of which is unimportant. This kind of question demands Relevant Selection, in which the task is to select only that information which is necessary and helpful in finding a solution.

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8   The following table gives figures for the percentage growth per year of labour productivity per person per year in various countries during three periods.

	Period 1	Period 2	Period 3
Japan	8.5	3.0	3.2
France	5.4	3.0	2.6
United Kingdom	3.6	1.5	2.4
Belgium	3.3	2.8	2.3
Sweden	4.1	1.5	1.8
Denmark	4.3	2.6	1.7
Italy	6.3	3.0	1.6
Netherlands	4.8	2.7	1.6
Germany	4.5	3.1	1.6
United States	2.2	0.0	0.8

Which country's percentage growth per year remained consistently greater than half of its Period 1 level in the following periods?

A   Belgium

B   Denmark

C   France

D   Germany

E   United Kingdom

For this question, you need first to be clear what you need to do to find the answer: you must identify which row of the table contains numbers in the 'Period 2' and 'Period 3' columns that are more than half the number in the 'Period 1' column.

By quickly comparing the 'Period 1' and 'Period 2' columns, you can eliminate all but France, Belgium, Denmark, Netherlands and Germany. By comparing 'Period 1' and 'Period 3' you can eliminate all but Belgium. So the correct answer is **A**.

Finding Procedures

Sometimes you will find that even if you have selected all the relevant information, no solution presents itself. For this type of question, you have to find a method or procedure which you can use to generate a solution.

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9 The 400 seats in a parliament are divided amongst five political parties. No two parties have the same number of seats, and each has at least 20.

What is the largest number of seats that the third largest party can have?

A 22

B 118

C 119

D 120

E 121

Questions of this type often provide you with very little information, all of which may be needed in order to solve the problem. The task is to develop and apply a strategy that you can use to find the correct answer.

Five parties share 400 seats. For the third largest party to have the maximum number of seats, the other parties must have the minimum number, whilst still meeting the other conditions set out in the question. So the fourth and fifth largest parties will have 21 and 20 seats respectively. This leaves 359 seats to be divided between the three largest parties.

For the third largest party to have as many seats as possible, the other two must have only slightly more seats. If we divide the remaining 359 seats as nearly as possible into thirds, we get: 1st = 120; 2nd = 120; 3rd = 119. However, this violates the condition that no two parties have the same number of seats. To avoid this, one of the seats of the third largest party must be transferred to the largest party.

This gives: 1st = 121; 2nd = 120; 3rd = 118; 4th = 21; 5th = 20. The answer is **B**.

Identifying Similarity

In this type of question you will be presented with information and asked to identify the same information presented in a different way, or a situation in which different information has a similar structure.

10   The graph below shows a person's bank balance at the end of each month in a year.
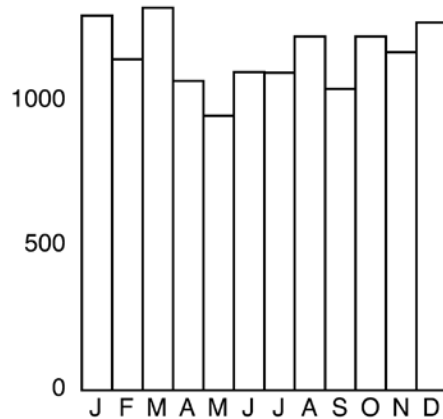
Which one of the following graphs could show the actual change in the bank balance each month?
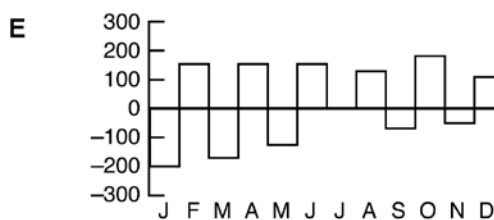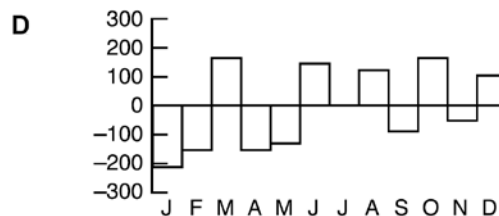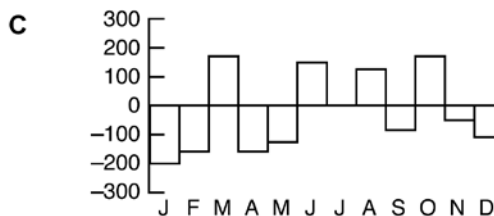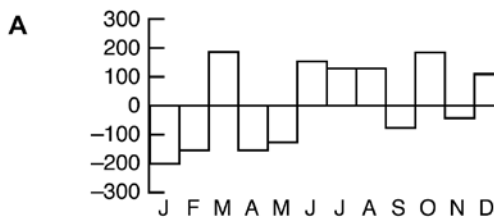
To solve this problem, you must first be clear about how the two types of graph represent the same information. The main graph shows the balance at the end of each month; the graphs in the options show us the *change* in the balance during each month. So, for example, the bar for February in the options represents the difference between the bars for January and February in the main graph.

In the main graph, the balance goes down between the end of January and the end of February, so the bar for February in the options should be negative. A comparison of the options shows that this is true only for options **A**, **C** and **D**, so options **B** and **E** can be excluded. By comparing the values for each month in this way, you should find that the correct option is **D**.

Appendix: Mathematical knowledge and skills needed

Number concepts
- simple fractions
- place value (for example, knowing that the "5" in "7654" indicates "50")
- ideas about percentages (for example, the idea that 1% could be thought of as "1 in every 100", and that if 20% of a group of adults are men, 80% must be women).

Numerical operations
- the four rules of number (addition, subtraction, multiplication, division)
- percentage operations (for example, if something was sold at £10, and is now advertised at "20% off", how much would the customer pay?)
- calculations in everyday contexts (complex calculations with fractions and decimals are not required).

Quantities
- time and the calendar
- money
- measures as shown below.

length	weight	area	volume (capacity)
kilometre (km)	kilogram (kg)	square centimetre (cm^2)	cubic centimetre (cm^3)
metre (m)	gram (g)	square metre (m^2)	litre (l)
centimetre (cm)			
millimetre (mm)			

Knowledge of the following relationships is also required:
1 km = 1000 m   1 m = 100 cm   1 cm = 10 mm   1 kg = 1000 g

Space and spatial reasoning
- area (including the calculation of the area of a rectangle)
- perimeter (including calculation)
- volume (including the calculation of the volume of a box)
- reflections (in mirrors) and rotations of simple shapes
- two-dimensional (2D) representations of three-dimensional (3D) shapes (for example being able to interpret a "bird's eye view" of a house).

Generalisation
- recognition that some operations are generalisable, for example that converting 24 to 3 and 40 to 5 both involve division by 8 (formal algebra is not required).

Tables and graphs
- extracting information from graphs
- extracting information from tables.

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