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Examiners' Report Summer 2007

GCSE

GCSE Design & Technology
Systems and Control Technology (1974/3974)

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Summer 2007

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GCSE Design and Technology:
Systems & Control Examiners' Reports

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GCSE Design & Technology: Systems & Control
Principal Moderator's Report June 2007
Unit 1974, Paper 01 (Coursework)

General comments

Where centres chose an electronics approach most offered projects at the appropriate KS4 level of demand. On the other hand few of those who chose a mechanisms route were able to provide projects that went much further than a modelling stage of manufacture.

Generally speaking, most centres provided suitable designing opportunities to meet all areas of the assessment criteria.

The quality of finished projects is improving and it is apparent that some well equipped schools are making good use of new and available technology resources. Most commonly these technologies include computer software to design circuits, programmable micro chips (PICS) and Printed Circuit Board resources. The introduction of laser cutters also improved the quality and finish of many products seen this year.

While the quality of photographs improved, not all centres provided sufficient photographic evidence. Further photographic evidence to support the 'Select and Use' and the 'Development' stage would greatly assist the moderation process.

Most centres continue to provide annotation indicating where evidence of marks awarded can be found. However, some failed to ensure candidates number each page, which resulted in the moderator spending longer than necessary seeking evidence.

Section 1

This has improved, with many candidates gaining medium or top marks in each of the three sections. However, a number of candidates failed to recognise the importance of the specification often only providing simple statements that did not promote or require any analytical thinking. The need to recognise the importance of using the specification to measure each stage of progress requires more consideration by some centres.

Section 2

This is becoming a more difficult area of assessment. The wider use of design software enables candidates to quickly discover successful ideas; unfortunately this often diverts their attention from addressing key requirements for this area of the marking criteria. Centres should encourage candidates to embrace a wider range of strategies as they develop each idea. Quite often, when using computer software to design circuits, candidates by-pass much of the analysis that might otherwise be used when selecting and using the component parts. Too often strategies with too narrow a range are evident at the development stage. Candidates who successfully use computer software as a designing tool need to consider how their candidates can gain sufficient breadth to enable the designs to be reviewed constructively.

Candidates are expected to develop a final design proposal based on the ideas already produced and to refine, test, and detail the proposal ready for manufacture. 'Development' was often leniently awarded, as this must show how an existing idea has changed or moved on. Too often centres awarded high marks where a candidate simply reproduced an alternative screen shot of a previously listed idea with few modifications or 'development.'

Evidence of how an existing idea has changed or moved on is an essential feature of the development of an idea; the final design proposal should match and be measured against each of the key features listed in the specification.

Section 3

Many candidates now score high marks in this section. ICT resources enable many candidates to present work at a high level of communication and it is rewarding to see candidates make full use of their communication skills t. However, centres must recognise that to award a high mark for written communication candidates must use an appropriate level of specialist vocabulary.

Section 4

A surprising number of candidates still fail to score high marks for this section. For Systems & Control many are let down by failing to explain where inputs, processes, outputs and feedback occur.

Candidates can help themselves by producing an outline plan for one manufacturing activity that explains the inputs, processes, outputs and feedback of a manufacturing activity, showing where performance / quality control checks will be triggered.

A number of centres were generous in awarding high marks for 'Schedule'. Many candidates failed to include quality control in their time plans. To achieve the high mark award the schedule must contain details for the manufacture of their product that includes making processes and details of materials and time projections that show when quality control will be applied. The schedule must illustrate the correct sequence of operations undertaken during a manufacturing activity that relates directly to a candidate's product.

Where candidates successfully used an appropriate industrial method of manufacture they were not always fully credited. Many who designed and manufactured a P.C.B. or designed and manufactured components using a vacuum forming machine or CAD/CAM were able to score a high mark in this section.

Section 5

Centres need to provide more evidence when awarding top marks for this area of the marking criteria. Teacher observation alone is insufficient to award high marks. Some centres still fail to recognise the need for candidates to provide evidence in their design folio showing the candidates ability to select a range of appropriate tools, equipment and processes and use them with a high degree of skill and accuracy.
Candidates need to provide evidence in their folders showing how and why they select and use tools and equipment. Photographic evidence along with an objective commentary might be used to show the progressive stages of manufacture. For the high mark award candidates must show how they use or adapt tools and equipment to

achieve precise outcomes. For example, few candidates who soldered components to a circuit board commented on the need to prepare surfaces to be soldered or recognised how flux is used with the solder to prevent oxides forming on the copper boards. Or if candidates focus on safety they should recognise issues related to using lead based alloys of the fumes given off by the solder flux.

Few candidates who attempted projects involving mechanical outcomes achieved high levels of success due to a number of issues. Some candidates found it difficult to move beyond the modelling stage of manufacture while others produced outcomes using only simple mechanical processes, which did not support or require the development of any high level making skills.

Candidates are required to recognise and show some understanding of risk assessment. Some candidates are still being awarded high marks based on teacher observation. This alone does not qualify for more than a single mark. For higher marks candidates must provide more detailed accounts of how they considered risk assessment, including detailed information of precautions which relate to both themselves and others.

Section 6

In this section of the marking criteria many did not score well, quite often due to either a weak initial specification or superficial tests that were not measured against the key features identified in the original specification list. To award a high mark it is a requirement that candidates:

- develop and use appropriate testing techniques to check the finished product against all aspects of the specification
- ensure that evaluation statements are based on the test results and the views of the end user(s)
- ensure that evaluations are objective statements supported by evidence

Where candidates carried out realistic trials that provided feedback from users and where they were able to show how each modification was based on reliable user feedback, they were generally able to achieve higher marks for modification. Those able to provide more detail on how each modification would improve the quality and performance of the product were those who scored the higher mark.

Summary

There are a number of centres that provided quality presentations of the designing and making process. In many, high quality outcomes are evident with sound candiates understanding of the course requirement; for some candidates the level of achievement often goes beyond the expectations of this specification, and these certainly set the measure as to what can be achieved. Centres are encouraged to allow candidates to develop their own ideas, rather than setting constraints in templates for them. While this approach often leads to photographic evidence showing high quality outcomes, it fails candidates by often restricting an independent approach towards problem solving. In some centres, the introduction of specialist designing software resulted in repetitive or similar system designs often too generously awarded. These candidates might benefit by breaking down their designs to the component level. Further commentary recognising the value of each component along with any sub-system building blocks may assist in the understanding

and knowledge gained. It is not possible to agree the high marks awarded by some centres when candidates have not considered the broad, detailed understanding of the component parts. Centres that award high marks for projects with a low level of demand are adjusted accordingly.

GCSE Design & Technology: Systems & Control (Electronics)
Principal Examiner's Report June 2007
Unit 1974, Paper 2F

General Comments

Candidates' responses to both the higher and foundation papers were disappointing. The paper was designed with fewer 'explain' and 'describe' type responses which should have allowed more access and given candidates greater opportunity to demonstrate their knowledge and understanding. Unfortunately this did not seem to be the case, especially for the higher paper. Whilst candidates are getting better at answering the design question and the product analysis question, they are poor at answering questions on electronic theory. Many candidates struggled with the most basic fundamentals underpinning the subject.

The following comments are focused on each question, giving details where candidates scored well and where they gave cause for concern. These comments should be read in conjunction with the published mark scheme.

Question 1

(a)(i)
Most candidates were able to identify three of the five components, tools or equipment. Some were unable to identify the transistor.

(a)(ii)
Those candidates who identified the components, tools or equipment were also able to give a reason.

(b)(i)
Most candidates could give a safety measure, and many were able to give two. Some repetition of the question was evident.

(b)(ii)
Most candidates could give a reason for using the soldering iron holder.

(c)
The majority of candidates named a suitable tool for cutting the leg but many failed to describe where it should be cut.

(d)
The majority of candidates were able to select at least two of the three correct words from the given list.

(e)
'Saves time' and 'saves money' were the popular advantages given by many candidates. Few candidates scored no marks.

(f)
The use of a named search engine, usually Google, gained at least one mark for most candidates.

Question 2

(a)
The majority of candidates could name two or three of the four components in the circuit. The least well identified was the LDR.

(b)
Some candidates recognised R3 as a protection resistor. Fewer recognised R3 as current control.

(c)
Generally candidates could not give a reason for the variable resistor. Many described what it does, ie varies the resistance, but did not relate it to the circuit. This was disappointing as it has been asked before in past papers.

(d)
Many candidates could calculate resistors in series.

(e)
Few candidates could describe, in simple terms, what happens in the circuit. Some gained marks for saying the output sounds.

(f)
Few candidates understood that the diode was there to protect the transistor.

(g)(i)
Many candidates managed to gain some marks from the three advantages, usually on size and cheapness.

(g)(ii)
Few candidates could explain a disadvantage but many gained a single mark for stating one disadvantage.

(h)
Candidates that gave CAM answers scored well.

(i)(1)
Environmental disadvantages have been well taught and many candidates scored both marks for this question.

(i)(2) Most candidates could describe how products could be recycled.

Question 3

(a)
Candidates who read the question correctly, were able to gain high marks for their first design but less for the second. They tended to repeat details from design one. This was especially true of materials and 'batch' manufacture.

(b)
Few candidates could evaluate their designs or state anything different from part (a).

Question 4

(a)
Many candidates gained the two marks for giving 'cost effective' and 'people would buy them' for 'market', one for 'weather proof' for 'quality', but failed to give an environmental point. Many gave points about the environment in which the lamp is to be used and this gained no marks.

(b)
Many candidates did not read the question and gave answers relating to the cover over the solar panels rather than the light dome.

(c)
Candidates could usually give at least one reason for using blow moulding but many gave 'cheap' without qualification which gained them no mark.

(d)
Properties of materials are not well understood by candidates and marks for this question were not good. Many candidates gave 'cheap' and 'strong'. Some gave 'rigid' which was in the stem of the question.

(e)
No candidates could relate the black polystyrene as the separating factor between the LDR and the LEDs. Without it the LDR would be forever switching during the night.

(f)
In contrast to part (e), the majority of candidates could explain why plastic dip coating was used.

(g)(i)
Many candidates gave confused answers relating to solar panels rather then the LDR switching the circuit on.

(g)(ii)
This was well done by a significant number of candidates who usually gave the 'stake' answer.

GCSE Design & Technology: Systems & Control (Electronics)
Principal Examiner's Report June 2007
Unit 1974, Paper 2H

Question 1

(a)
Many candidates gained the two marks for giving 'cost effective' and 'people would buy them' for 'market', one for 'weather proof' for 'quality', but failed to give an environmental point. Many gave points about the environment in which the lamp is to be used and this gained no marks.

(b)
Many candidates did not read the question and gave answers relating to the cover over the solar panels rather than the light dome.

(c)
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(g)(i)
Many candidates gave confused answers relating to solar panels rather then the LDR switching the circuit on.

(g)(ii)
This was well done by a significant number of candidates who usually gave the 'stake' answer.

Question 2

(a)(i)
This proved surprisingly difficult for most candidates and many seemed to guess their answers.

(a)(ii)
Connecting the NAND gates to make a NOT gate was achieved by many candidates but should have been achieved by the majority.

(a)(iii)
Cross coupling N gates to achieve a Bistable was asked in the 2005 series and it then was not well done. This series, candidates also struggled with this question and few were able to gain even one mark.

(b)(i)
The majority of candidates did not know why a logic IC could not drive a buzzer.

(b)(ii)
It follows that candidates could not overcome the problem in this part of the question either.

(c)(i)
Prototyping a circuit has been extensively asked in past papers and most candidates could give, if not explain, a reason for prototyping an electronic circuit.

(c)(ii)
Most candidates could give ways in which computer modelling would make design and manufacture more efficient, though many gave irrelevant and generic CAD answers which did not answer the question.

(d)
CAD, on the other hand, was answered well by many candidates.

(e)
Many candidates gave generic reasons for testing rather than specific answers to computer testing which gained them few marks.

(f)
Most candidates did not know what CIM is, giving generic CAM type answers which earned them no marks. This was disappointing as a similar question was asked in the 2005 question paper.

Question 3

(a)
Most candidates gained high marks for their first design but many could not give an alternative that was significantly different. Much of the detail was similar to the first, gaining few marks. It was recognised by examiners that this was a hard question for many candidates.

(b)
Few candidates could evaluate two points for each specification. Many repeated information already credited in part (a).

(a)(i)
Some candidates gave VR1 as temperature control but many could not. As a basic input circuit to any control circuit this was disappointing.

(a)(ii)
Those candidates who concentrated on the action of the thyristor rather than the circuit gained marks but many tried to go beyond the thyristor which earned them few marks.

(a)(iii)
Most candidates could not describe the action of a basic comparator operational amplifier.

Question 4

(a)(iv)
The majority of candidates failed to take the 1V away from the 9V to give the voltage drop across R1 as 8V. The calculation was then 8/1000 to give 8mA.

(a)(v)
Many candidates generally substituted R1 in the circuit diagram into the formula, instead of VR2, which was not worth any marks.

(b)(i)(ii)
The use of PICs was well taught by many centres and candidates generally scored well.

(c)
Most candidates scored the one mark for giving an environmental advantage of using control systems in domestic appliances.

(d)
Recycling was well answered by most candidates.

GCSE Design & Technology: Systems & Control (Mechanisms)
Principal Examiner's Report June 2007
Unit 1974, Paper 3F

General Comments

This year's question paper was designed to allow greater access for candidates by asking more 'give' and 'name' questions than in previous years. Unfortunately this was not reflected in the overall scores. Candidates had problems with mechanical theory, finding a second design solution and struggled to evaluate designs.

Question 1

(a)(i)
Most candidates recognised this type of question but they had difficulty naming the micrometer.

(a)(ii)
Generally, those candidates who could name a tool, component or equipment could give a use for it.

(b)(i)
Many candidates could not provide a suitable finish for a wooden handle.

(b)(ii)
Most candidates could give a reason for the side handle.

(b)(iii)
Most candidates could give a reason for using a rivet.

(c)
Most candidates could give one precaution.

(d)
Most candidates could complete the sentences.

(e)(i)
Few candidates could *explain* an advantage of using CAD but many gained a single mark for *giving* one.

(e)(ii)
Candidates struggled to give three benefits of using CNC machinery and many gave none.

Question 2

(a)(i)
Few candidates gave steel for the ferrous metal.

(a)(ii)
Candidates often misinterpreted what was meant by 'properties' and therefore this question was poorly answered.

(b)(i)
Most candidates gained the mark by giving pivot or fulcrum.

(b)(ii)
No candidate gained two marks for naming different bearings.

(c)(i)
Few candidates could explain 'equilibrium' but most gained at least one mark for giving balanced.

(c)(ii)
Few candidates could describe the effect but most gained at least one mark for giving it tipping over.

(d)
This question was well done by some but most candidates gained one mark.

(e)
Candidates could not give two ways related to cost. Some confused CAM with CAD.

(f)
Very few candidates scored anything for giving environmental issues.

(g)
No candidates *explained* two advantages of safety standards but many gained two marks for *giving* an advantage. Most candidates gained at least one mark.

Question 3

(a)(i)
Design one. Most candidates gained both marks for showing a way of clamping and releasing the bar.

Design two. Candidates, in general, could not give something different from design one.

(a)(ii)
Design one. Many candidates gained both marks for being able to drill the hole.

Design two. Some candidates gained both marks.

(a)(iii)
Design one. Many candidates forgot about the table clamping altogether.

Design two. Few candidates gained marks.

(a)(iv)
This was poorly completed. Very few candidates gained marks for a workshop process. Many gave generic materials such as wood, metal or plastic.

(b)
Evaluating is a difficult skill, especially for candidates taking the foundation paper. Centres are encouraged to spend more time with their candidates helping them to develop these skills.

Question 4

(a)
A wide range of marks were scored on this question, which made it a good discriminator. No candidate gained all six marks but, at the other extreme few gained none.

(b)
Many candidates gained two marks for giving reasons for using aluminium. Most candidates gained at least one mark.

(c)
Most candidates gained only one mark for using a bearing.

(d)
In general, candidates could not give suitable properties for a thermoplastic material.

(e)
Very few candidates explained a reason for using red plastic to cover the rear reflector.

(f)
Candidates could not *explain* why the chain was kept lubricated, though many gained one mark for *giving* a reason.

GCSE Design & Technology: Systems & Control (Mechanisms)
Principal Examiner's Report June 2007
Unit 1974, Paper 3H

General Comments

The question paper was designed to allow wider access for candidates by giving more 'give' and 'describe' questions, rather than 'explain' questions, but this was not reflected in candidates' responses. The design question was answered better than in the past but the evaluation part was poorly done. However, some centres had clearly taught their candidates how to gain good marks from this section. Candidates recognised the product analysis question and, it was generally well done.

Question 1

(a)
A wide range of marks were scored on this question, which made it a good discriminator. No candidate gained all six marks but, at the other extreme few gained none.

(b)
Many candidates gained two marks for giving reasons for using aluminium. Most candidates gained at least one mark.

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(d)
In general, candidates could not give suitable properties for a thermoplastic material.

(e)
Very few candidates explained a reason for using red plastic to cover the rear reflector.

(f)
Candidates could not *explain* why the chain was kept lubricated, though many gained one mark for *giving* a reason.

Question 2

(c)
There were very few correct responses to this question.

(d)
Prototyping is well taught by many centres and most candidates could scores good marks in this area.

(e)
Most candidates confused CIM with CAM but where the answers overlapped, such as low labour costs, they gained some marks.

(f)
ICT in stock control was not understood by many candidates.

Question 3

(a)
There was a pleasing improvement in the overall performance by candidates for this question. The areas least well done were bullet point three, the fixing of the wheels to the axle, and bullet point four, materials and processes.

(b)
This question was not well answered. It was pleasing to note, however, that some centres have taught their candidates how to answer the question and those candidates earned high marks.

Question 4

(c)
The large majority of candidates scored at least two marks on this question with the most common responses relating to lubrication, maintenance and the fact that the drill would not jam.

(d)(i)
Almost all candidates scored the one mark allocated here giving wide range of correct responses.

(d)(ii)
Again most candidates scored the one mark here.

(e)
The large majority of candidates scored at least one mark here with the most common responses relating to loss of employment and redundancy. A common problem, however, was that candidates did not fully explain their responses and therefore did not score the second mark.

GCSE Design & Technology: Systems and Control
Principal Moderator's Report June 2007
Unit 3974, Paper 01 (Coursework)

General Comments

Only three centres entered candidates for the Short Course. From these centres there were some high quality pieces of work that demonstrated sound understanding of the course requirement. For some the level of achievement often goes beyond the expectations of this specification, and these candidates set the measure as to what can be achieved. Centres are encouraged to allow candidates to develop their own ideas, rather than setting constraints or templates for them. While this approach often leads to photographic evidence showing high quality outcomes, it fails candidates by often restricting an independent approach towards problem solving. Furthermore, the introduction of specialist designing software sometimes resulted in repetitive or similar system designs often too generously awarded. These candidates might benefit by breaking down their designs to the component level. Further commentary recognising the value of each component along with any sub-system building blocks may assist in the understanding and knowledge gained. It is not possible to agree the high marks awarded by centres when candidates have not considered the broad, detailed understanding of the component parts. Centres that award high marks for projects with a low level of demand are adjusted accordingly.

GCSE Design & Technology: Systems & Control (Electronics)
Principal Examiner's Report June 2007
Unit 3974, Paper 2F

General Comments

There were very few entries for either level of the short course this year. Generally, the product analysis question was answered well by both tiers but the theory questions were not answered very well by the higher tier candidates.
The following comments are focused on each question giving details where candidates scored well and where they gave cause for concern. These comments should be read in conjunction with the published mark scheme.

Question 1

(a)(i)
Most candidates were able to identify three of the three components, tools or equipment. Some were unable to identify the transistor.

(a)(ii)
Those candidates who identified the components, tools or equipment were also able to give a reason for each.

(b)(i)
Most candidates could give a safety measure, and many were able to give two. Some repetition of the question was evident.

(b)(ii)
Most candidates could give a reason for using the soldering iron holder.

(c)
The majority of candidates named a suitable tool for cutting the leg but many failed to describe where it should be cut.

Question 2

(a)
The majority of candidates could name two or three of the four components in the circuit. The least well identified was the LDR.

(b)
Some candidates recognised R3 as a protection resistor. Fewer recognised R3 as current control.

(c)
Generally candidates could not give a reason for the variable resistor. Many described what it does, ie varies the resistance, but did not relate it to the circuit.
This was disappointing as it has been asked before in past papers.

(d)
Many candidates could calculate resistors in series.

(e)
Few candidates could describe, in simple terms, what happens in the circuit. Some gained marks for saying the output sounds.

Question 3

(a)
Many candidates gained the two marks for giving 'cost effective' and 'people would buy them' for 'market', one for 'weather proof' for 'quality', but failed to give an environmental point. Many gave points about the environment in which the lamp is to be used and this gained no marks.

(b)
Many candidates did not read the question and gave answers relating to the cover over the solar panels rather than the light dome.

(c)
Candidates could usually give at least one reason for using blow moulding but many gave 'cheap' without qualification which gained them no mark.

(d)
Properties of materials are not well understood by candidates and marks for this question were not good. Many candidates gave 'cheap' and 'strong'. Some gave 'rigid' which was in the stem of the question.

(e)
No candidates could relate the black polystyrene as the separating factor between the LDR and the LEDs. Without it the LDR would be forever switching during the night.

(f)
In contrast to part (e), the majority of candidates could explain why plastic dip coating was used.

(g)(i)
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(g)(ii)
This was well done by a significant number of candidates who usually gave the 'stake' answer.

GCSE Design & Technology: Systems & Control (Electronics)
Principal Examiner's Report June 2007
Unit 3974, Paper 2H

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(b(i)
The majority of candidates did not know why a logic IC could not drive a buzzer.

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It follows that candidates could not overcome the problem in this part of the question either.

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(a)(v)
Many candidates generally substituted R1 in the circuit diagram into the formula, instead of VR2, which was not worth any marks.

GCSE Design & Technology: Systems & Control Technology
(Full Course: 1974)

Grade Boundaries – Summer 2007

Overall Grades

The figures given below are the minimum subject marks required for each overall grade in the summer 2007 examinations.

(Foundation Tier (Option 1) out of 100)

C	D	E	F	G
53	43	33	23	13

(Higher Tier (Option 2) out of 100)

A*	A	B	C	D	E
75	65	55	46	34	28

(Foundation Tier (Option 3) out of 100)

C	D	E	F	G
52	42	33	24	15

(Higher Tier (Option 4) out of 100)

A*	A	B	C	D	E
78	66	54	43	36	32

Component Marks

The figures given below are the minimum marks required for each component grade in the summer 2007 examination.

(Coursework 01 out of 102)

A*	A	B	C	D	E	F	G
92	80	68	56	45	34	23	17

(Paper 2F out of 88)

C	D	E	F	G
47	38	29	20	11

(Paper 2H out of 88)

A*	A	B	C	D	E
49	42	35	28	17	11

(Paper 3F out of 88)

C	D	E	F	G
41	34	28	22	16

(Paper 3H out of 88)

A*	A	B	C	D	E
52	43	34	25	20	17

GCSE Design & Technology: Systems & Control Technology
(Short Course: 3974)

Grade Boundaries – Summer 2007

Overall Grades

The figures given below are the minimum subject marks required for each overall grade in the summer 2007 examinations.

(Foundation Tier out of 100)

C	D	E	F	G
52	42	32	22	12

(Higher Tier out of 100)

A*	A	B	C	D	E
75	65	55	45	35	30

Component Marks

The figures given below are the minimum marks required for each component grade in the summer 2007 examination.

(Coursework 01 out of 84)

A*	A	B	C	D	E	F
76	66	56	46	37	28	19

(Paper 2F out of 44)

C	D	E	F	G
21	17	13	9	5

(Paper 2H out of 44)

A*	A	B	C	D	E
24	20	16	13	9	7

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