Grade 10 Computing

Unit 9 · The Future of Computing

ANSWER KEY · FOR TEACHERS

Full marks 28

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. emerging technology
2. established technology
3. geostationary orbit
4. qubits
5. post-quantum encryption
6. regulatory sandbox
7. sunset clause
8. technology-neutral

Each carries 0.5 mark. **K · 4**

2 Label the diagram

1. Telecommunications Act
2. The first mobile network
3. A fiber link through China
4. The COVID-19 lockdown

Each carries 0.5 mark. **K · 2**

3 Multiple choice

i. **b.** The satellite is so far away that light needs that long to travel up and down twice. **U · 1**

The satellite is 35,786 km up, so a message goes up and down (about 72,000 km), and the answer comes up and down again: over 143,000 km. At 300,000 km a second that takes about 0.48 seconds. Radio waves are light of a kind we can't see, and travel at the same speed; the delay comes from distance, which no equipment can remove.

ii. **b.** students in towns with good English and fast internet gain much more than others, so the gap between them grows **U · 1**

Being free removes one barrier, money, but not language or connection. The people who already have the most can use it best, so they gain the most: an inequity in both access and outcomes.

iii. **c.** Mountains that made cables slow and costly to lay, so satellites came first **U · 1**

The land itself shaped the technology. The Act and competition are factors of government and business, and families abroad a factor of society.

iv. **c.** a date in December 1901 **A · 1**

After its biggest value, 2,147,483,647, a signed number overflows to its most negative value, −2,147,483,648: that many seconds **before** 1970, which is 13 December 1901.

v. **c.** Don't pay or reply; it is a scam. Tell someone, and report it to the Cyber Bureau if you lost money. **A · 1**

Easy money for simple tasks, a fee first, and a chat instead of an interview: all the signs of a job scam. A real employer never asks you to pay.

4 How long does the signal take?

ANSWER

The signal goes up and down twice, so it travels 4 × the height.

i. 4 × 35,786 = 143,144 km; 143,144 ÷ 300,000 ≈ **0.48 seconds**, about half a second.

ii. 4 × 550 = 2,200 km; 2,200 ÷ 300,000 ≈ **0.007 seconds**, about 7 thousandths of a second.

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Half a second is long enough for people on a call to talk over each other; 7 thousandths isn't noticed. No equipment can make the trip shorter than light takes. A · 3

MARKING SCHEME

- ✓ The distance is 4 × the height: 143,144 km and 2,200 km.
- ✓ About 0.48 s through the geostationary satellite, and about 0.007 s through the low-orbit one.
- ✓ Half a second makes a call awkward (people talk over each other); a few thousandths doesn't.

5 What does it print?

ANSWER A · 4

```
OUTPUT
75 24
88 11
92 7
75 -75
88 -88
92 -92
```

ii. The year 2000 is stored as 0, which the program reads as 1900, so everyone's age comes out negative. Storing years with four digits (1975, 2000) gives the right ages: 25, 12 and 8.

MARKING SCHEME

- ✓ 75 24, 88 11, 92 7: right in 1999.
- ✓ 75 -75, 88 -88, 92 -92: in 2000, "0" is less than every birth year.
- ✓ The program takes "00" as 1900, so the ages are negative (the Y2K problem).
- ✓ Store the year with four digits (or the whole date), so 2000 − 1975 = 25.

6 Which kind of gap?

ANSWER U · 2

i. A; ii. 0; iii. A; iv. 0.

MARKING SCHEME

- ✓ i. A and iii. A: these students can't use it at all (no signal, no money).
- ✓ ii. 0 and iv. 0: both use it, but one gains far more than the other.

7 Short answers

a. MARKING SCHEME U · 3

- ✓ A regulatory sandbox lets companies try a new product with real customers, under a regulator's close watch and within limits, before the full rules are decided.
- ✓ It helps because nobody yet knows an emerging technology's effects: the idea isn't blocked, customers are protected, and the regulator learns before writing lasting rules.
- ✓ A sunset clause says a rule ends on a set date unless it is renewed, so a rule written for today's technology is checked again.

b. MARKING SCHEME A · 3

- ✓ A benefit: quick payments, no change needed, a record of every sale and payment, less cash to be stolen.
- ✓ A risk: nobody can pay when the network or the power fails; or scams and fees; or people without a phone can't buy.
- ✓ A long-term effect: records can help shops get loans, but every purchase is kept for years by companies, and people without phones are shut out; keeping cash possible too is safer.

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8 Think

ANSWER **HA · 2**

He was right that a law changed for one company is a bad law: it rewards whoever is biggest, and it will be wrong for the next company and the next technology. But the rule can still change, for everyone: a technology-neutral rule might let any company offering internet from low-orbit satellites be licensed under the same conditions: register in Nepal, have people here who answer complaints, pay the same taxes as Nepali providers, follow Nepal's laws on data, and let Nepali companies resell its service. It could be tried first in a sandbox, in a few remote districts, with a review after two years.

MARKING SCHEME

- ✓ Agrees (or disagrees) with a reason: a law for one company rewards the biggest and won't fit the next company or technology.
- ✓ A rule for any low-orbit company, with at least two conditions (registered in Nepal, same taxes, Nepal's data laws, a sandbox or review first).

9 Activity: My plan

(not marked)

WHAT STUDENTS SHOULD FIND

Every plan is different; a good one is specific. It names what the student enjoyed in the course (programs, data, design, fixing things, the stories), gives two or three directions rather than one, backs each skill with something made (a program, the Unit 8 project, a chart, a web page), names real places to learn next (Grades 11–12 Computer Science, a CTEVT diploma, a course, a club, a project of their own) and ends with three small steps with dates, such as "finish my website for the shop by Chaitra 15".

Marks by level	Knowledge	Understanding	Application	Higher ability	**Total**
Marks	6	8	12	2	**28**

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