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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Standard Level

Paper 2

21 pages

Examiners should be aware that in some cases, candidates may take a different approach, which if appropriate should be rewarded. If in doubt, check with your Team Leader.

In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In the case of a "describe" question, which asks for a certain number of facts *e.g.* "describe two kinds", mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

"ITGS terminology refers to both the IT technical terminology and to the terminology related to social and ethical impacts."

SECTION A

Area of impact: Business and employment

1. (a) Identify *two* output devices on an ATM. ***[2 marks]***

- speaker
- screen / monitor
- printer (for receipt)
- headphone jack and customer plugs in headphones
- cash dispenser / slot to dispense cash / tray to dispense money (***N.B.*** **where** the cash comes out is not enough).

Award ***[1 mark]*** *for identifying each output device up to a maximum of* ***[2 marks]****.*

(b) Describe *one* example of fraud involving an ATM card and *one* possible solution to this crime. ***[4 marks]***

- fraud – a card skimmer, hidden on the ATM machine, reads the ATM card number and a camera captures the PIN when typed on the keypad *(need both for 2 marks)*.
  solution – biometrics is used to identify the customer / embedded security microchip makes card harder to copy / banks educate customers to look for unusual devices / to shield their hands when inputting PIN / banks check ATMs regularly for scam devices / ATMs sound an alarm if tampered with to alert police / ATM is set up inside a store where it is in view of employees who can report any suspicious behaviour.

- fraud – criminals access PIN numbers and encryption codes stored on databases and create counterfeit cards.
  solution – safer encryption methods that store encryption codes separate from PINs.

- fraud – criminals divert the ATM card when it is inserted, steal it, then shoulder surf to see the PIN.
  solution – customer education to be aware of criminals near the machines / immediate notification of card loss / banks make areas around ATMs private so onlookers can't look over customer's shoulder.

- fraud – phishing scams collect ATM card numbers and PINs through e-mail responses.
  solution – banks educate customers and publicize that they never send e-mails / make phone calls requesting this data / a password in addition to a PIN is required for online transactions.

- fraud – new cards and PIN are stolen when sent through the mail to customers.
  solution – activation only occurs when customer contacts bank and provides personal information if telephoning.

- fraud – ATM card and PIN stolen. Thief attacks user, steals card, requests PIN.
  solution – biometrics is used to identify customer / install web cam to film ATM, video feed sent to bank or security firm / notify bank of theft and cancel card.

- fraud – criminals get card details and PIN – by installing malware on ATM which records the data on the magnetic stripe plus the PIN.
  solution – regularly scan ATMs to check for malware / install ATM inside a store so employees can see any suspicious activity.

- fraud – a false ATM can collect the card and record the PIN number that the user typed in (the card is then taken from the dummy machine by the criminals and used in a real machine to withdraw cash).
  solution – biometrics as identification of the card holder.

- fraud – a card skimmer is installed in the ATM machine and will go unnoticed by the bank customer and with a camera will record the details of the card and PIN.
  solution – "banks such as AVB and NBC have provided a green-lit slot protector fitted to the slot that reveals any third party reader that was placed in there".

*Award **[1 mark]** for identifying a fraud and **[1 mark]** for identifying a solution up to a maximum of **[2 marks]**. Award **[1 mark]** for each relevant description up to a maximum of **[2 marks]**.*

(c) Explain *two* validation processes that take place when you use the ATM to withdraw money from your bank account. ***[4 marks]***

- ATM reads expiry date from the ATM card and the expiry date is checked against the current date – to verify the ATM card is valid
- account details are sent to the bank's central computer where they are matched in the customer database – to verify the account is valid
- the PIN/password is entered – and sent to the bank's central computer to verify it is valid for that account number
- the withdrawal amount is sent to the bank's central computer and the amount is compared with the balance – to ensure there are sufficient funds
- the withdrawal amount is checked – to ensure it does not exceed a preset limit
- the daily number of transactions is checked – to ensure it has not reached a preset limit
- the number of PIN attempts is checked – to ensure it has not reached a preset limit
- ATM checks correct cash is available – checks against list of accepted denominations – most ATMs only dispense $50 or $20 notes so a request for $105 would not be valid
- account type is validated – *e.g.* user can choose Savings or Cheque and this must correspond to the user's account at the bank
- ATM checks that card is valid – card type is checked against a database of approved bank cards to be used in that ATM machine
- ATM checks 16 digit serial number and description.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2 marks]
Two processes identified or one process described.

[3 marks]
Two processes described with reasoning.

[4 marks]
A clear, detailed explanation giving reasons.

Answers must relate to validation.

(d) To what extent does the improved customer service offered by online banking outweigh the possible disadvantages for customers? ***[10 marks]***

Improved customer service

- more convenient – customers can access banking details from any place they can use the Internet
- time is saved – there is no need to travel to a bank/ATM or queue for bank teller
- easy access – unlike a bank, access is available 24/7
- cost saving – travel costs / fees are often cheaper than dealing with a bank teller
- Internet banking offers more services than an ATM – *e.g.* bill payment/viewing statements online
- customers may select language / several languages available – when going to a bank language will be limited to what the bank teller knows
- online banking is more anonymous/private – customers do not need to discuss/disclose financial details to teller.

Disadvantages for customers

- sensitive information is being sent over the Internet / stored on bank server and could be accessed by hackers
- if the web site is down accounts are not accessible
- customers may not have Internet access or the IT skills to use Internet banking
- customers are not able to make cash deposits/withdrawals
- customers need to keep access codes safe and accessible
- customers need to remain alert to potential scams – *e.g.* fake web sites posing as their bank / phishing scams asking for logons and passwords
- may not get an immediate response to queries – may have to wait for an e-mail reply
- less human interaction – some customers prefer talking to a bank teller
- there may be a difficulty correcting errors in online transactions.

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

SECTION B

Area of impact: Education

2. (a) Identify *two* types of software, other than an Internet browser, that must be available on a student's computer to make use of this learning environment. ***[2 marks]***

- word processor
- audio players
- video players
- spreadsheets
- picture viewers
- document viewers (flash documents, PDFs)
- decompression software to unzip files
- email software.

Accept product names as Word or Excel.

*Award **[1 mark]** for any one of the above types of software identified up to a maximum of **[2 marks]**.*

(b) Describe *two* ways in which teachers may solve students' problems and provide feedback using this web site. ***[4 marks]***

- email – students can e-mail the teacher who will respond to the individual student
- forum – students can post their questions in the forum where the teachers and others can participate and solve problems or doubts
- online chat – the forum provides a chat area were students and teachers can meet (scheduled) and exchange messages to solve problems or doubts
- uploading files – students may upload files with unfinished work, teachers may upload files with samples
- workshops – use the workshop features to work in teams and where teachers can provide feedback
- teachers can provide audio feedback by uploading an mp3 file – this can be downloaded by students and used even without an Internet connection.

http://computer.howstuffworks.com/cable-modem10.htm

*Award **[1 mark]** for each way identified up to a maximum of **[2 marks]**.*
*Award **[1 mark]** each for the relevant description up to a maximum of **[2 marks]**.*

(c) Explain how the VLE will allow each student access to the area of the web site which has the appropriate content of the subject they are requesting. ***[4 marks]***

- use of logins and passwords grant access to a certain area
- there is a database of students – the system checks against the database after login to assign the proper area/subject and show/allow access to the appropriate subject material
- after login, the student may be presented with a list of subjects to select, with a click they reach the desired one
- students have a different access login for the different subjects they are taking
- the VLE has a database of participants in the environment with different access privileges, some are allowed to read all, others will only read certain areas, others will be allowed to add content
- students may "enroll" in an appropriate course or area and then be part of the team/students with access to the materials and forums of the corresponding course.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of how the VLE recognizes/grants a student access although the answer may lack appropriate reasoning at the bottom end of the band.

[4 marks]
A clear, detailed explanation giving reasons of how the VLE provides access to the appropriate content.

(d) Evaluate the implications of the introduction of the VLE for the school *and* for the students. ***[10 marks]***

For the school

- system needs to be implemented – maybe new hardware/software is needed, teachers trained, time given to plan new types of lessons and materials, time to be available for online students who may be in different time zones
- it will have IT competent students
- if students return to their own school they will be able to fit into classrooms and lessons with less difficulties
- they would have to provide different type of assessment than the one used in the classroom
- some teachers may find it difficult to adapt to the use of the new technology – even with training some may find the use of the features of the software daunting
- initial costs may be high – increase of bandwidth, upgrading of file servers, teacher training may all have an initial cost for the school.

For the students

- they will need to have a computer with an appropriate Internet connection
- they might miss social interaction in the new places they go to live
- they might need private tutoring to keep up with the lessons – additional expense
- they might be able to interact with former friends and still participate in group activities
- system failure/electricity cuts could affect them keeping up with their work
- students may be tempted to have others do the work for them – there is no supervision and another student could be providing the answers or the work
- students may feel more comfortable asking questions to teachers without doing it in front of a whole group of classmates
- students will need greater motivation to work regularly using the VLE – responsible attitude or control by parents
- if meeting times are not arranged previously then students may lose time waiting for teachers to answer their questions.

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Students need to refer to implications for the school and implications for the students – if only one is addressed then a max of [6 marks] can be awarded.

Please see generic markband information sheet on page 21.

Area of impact: Arts, entertainment and leisure

3. (a) Define the term *resolution*. ***[2 marks]***

- resolution is the number of pixels on a display monitor
- the resolution of a digital image is defined as the number of pixels it contains
- ppi
- density of pixels / number of pixels
- dpi.

Accept dpi as many sites mention this but this is not the expected response.

*Award **[1 mark]** for "number of pixels".*
*Award **[1 mark]** for mentioning "on a display monitor" or "contained in a digital image".*

(b) Digital TV broadcasters are able to provide interactive services. Describe *two* interactive services that could be provided with digital TV. ***[4 marks]***

- select different camera angles – allow viewer to change the angle to watch a football match
- video on demand – allow viewer to request/select a film and begin watching it on demand
- managing film watching – pause, review, fast forward, skipping commercials
- some programs may receive text messages from viewers and content is changed according to key words in the message
- viewer participation in games – answering questions broadcasted or guess the end of a film
- surveys and polls
- interactive program guides
- providing deaf and hearing impaired people with a text version of dialogue *(as long as there is evidence that the deaf person had to choose (interact) in order for a service to be provided)*
- interactive multiplayer games – (play classic games like UNO and Monopoly with friends and family. Try your hand at poker or blackjack. Test your wits with puzzle and word games. With an Unlimited Pass, you can play as many games as you want, 24/7. Whatever your game, you'll find it in *GSN Game Lounge* – http://www.directv.com/DTVAPP/content/premiums/game_lounge)
- interactive customer support – (provides complete end-to-end solutions that not only include the front-end software, enabling viewers to interact, but also all required back-end tools for updating, deploying and operating your interactive services – http://www.zappware.com/about/technology.html).

*Award **[1 mark]** for each interactive service identified up to a maximum of **[2 marks]**.*
*Award **[1 mark]** each for the relevant description up to a maximum of **[2 marks]**.*

(c) Explain *two* ways in which a domestic installation such as a digital TV can communicate with the digital provider. ***[4 marks]***

- telephone – satellite viewers return information to the broadcaster via their regular telephone lines. They are charged for this service on their regular telephone bill
- ADSL – using the Internet connection users can communicate using a special control
- digital TV cable and set box with return capabilities – and the TV remote control user can select choices from screen or text messages.

*(Do **not** accept: antenna (does not allow for user to send data back to broadcaster).)*

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of how the domestic installation can communicate with the provider but the answer may lack appropriate reasoning at the bottom end of the band. ***[2 marks]*** *for two ways identified or one described.* ***[3 marks]*** *for two ways described.*

[4 marks]
A clear, detailed explanation giving reasons of two ways how the domestic installation communicates with the provider.

(d) To what extent is the growth of video clips on the Internet overtaking the need for digital TV? ***[10 marks]***

- quality of videos over digital TV is high while videos on the Internet tend to have lower resolution to allow for fast download
- streaming of videos over the Internet may be slow while digital TV provides films without delay while broadcasting
- downloading of videos may take several hours over the Internet – films on digital TV are there on demand
- many Internet videos are there for free, user only pays Internet access – digital TV requires a monthly fee (which users pay as well as paying their Internet provider fee)
- wider variety of films are available over the Internet – digital TV has a selection of films
- Internet has been around longer – fewer changes in hardware are expected – cable set-top boxes with better interactive capabilities are being introduced forcing users to spend money to upgrade their digital TV capabilities
- online video availability – will overtake digital TV
- viewers may prefer larger screen TVs even though the same video may be obtained and seen in a laptop or computer monitor.

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

Area of impact: Health

4. (a) Define the term *key field*. ***[2 marks]***

- it is unique
- it identifies one record in the database / one person in the Icelandic database
- an example *e.g.* ID number of the person
- it is used to link tables in a relational database.

*Award **[1 mark]** for the above points up to a maximum of **[2 marks]**.*

(b) Describe the process used to create a query which would produce an alphabetical list of all the citizens who have suffered from diabetes, were born after 1990 and do not smoke. ***[4 marks]***

- disease = diabetes / diabetes = yes / filter on field disease and type in "diabetes"
- year of birth > 1990
- smoker = no / filter on field smoker and type in "no"
- sort by surname/name or select surname or name and choose A–Z.

*Award **[1 mark]** for each aspect of the query up to a maximum of **[4 marks]**.*

Answers can be in sentence format.

- search the field disease/sickness/suffering for the word diabetes
- search the field year of birth for year greater than 1990
- search the field smoker for values yes/true
- list citizens that in field smoker have yes or true
- sort the results by surname/name.

(c) Explain the difference between data matching and data mining with reference to the Icelandic database. ***[4 marks]***

Data matching

- compares records in different databases to find individuals who appear in more than one database *e.g.* a person in the genetic profile database may also appear in a database of diseases
- may link databases on key fields *e.g.* ID to build up information about a person
- ID in the genetic database could be linked to other databases to identify the citizens.

Data mining

- looks for hidden relationships/patterns in data *e.g.* between genetic profile and various diseases
- does not generally identify individuals rather identifies patterns in the data *i.e.* uses ID instead of citizen's name
- researchers are looking for relationships between genes and diseases.

[1 mark]

A limited response that indicates very little understanding of the topic.

[2–3 marks]

A reasonable description of data matching and data mining, although the answer may be unbalanced and may not relate to the Icelandic database at the bottom end of the band.

[4 marks]

A clear, detailed and balanced explanation of the difference between data matching and data mining with reference to the Icelandic database.

(d) To what extent do the advantages to medical research outweigh the concerns of some Icelandic citizens about storage of their genetic data? ***[10 marks]***

Advantages to medical research

- genes can be linked to diseases / predict health problems
- drug companies can design drugs more effectively.

Concerns of Icelandic citizens

- genetic information about citizens could be given to drug companies – however participation in drug trials could be beneficial
- people who are not ill but carry the genes may be discriminated against socially/ in the workplace/when purchasing life insurance
- data may not be reliable at the level of genetic testing or data entry
- some citizens may not wish to know if they have a gene that could result in a disease later in life
- DNA is a unique identifier and, once shared, it cannot be retrieved
- in a small community it may be difficult to mask individual identity in the database
- security of the data – how is it secured against unauthorized access? / could lead to identity theft
- genetic information could result in unexpected revelations *e.g.* paternity.

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

Area of impact: Science and the environment

5. (a) From the simulation shown in the Diagram on the previous page,

(i) identify *one* input ***[1 mark]***

- season
- location
- structure
- glazing
- ventilation
- evaporative cooling
- heating
- plants
- set points.

Only accept items in this list.

(ii) identify *one* output. ***[1 mark]***

- solar radiation / air temperature / relative humidity / humidity ratio *(need to mention one of these four graphs, not just the word graphs)*
- picture or animation of the actual greenhouse / plant growth
- data about the city *e.g.* elevation, latitude, longitude
- time counter in days.

Only accept items in this list.

*Award **[1 mark]** for identifying any one input.*
*Award **[1 mark]** for identifying any one output.*

(b) Describe *two* tasks which must be performed in the development of simulation software like that used in the Diagram on the previous page. ***[4 marks]***

- gather a database of data *e.g.* items in part (a) (i) such as types of glazing, ventilation
- develop formulae to calculate the expected output given different inputs
- test the results to check they conform with real life information
- design the user interface (*e.g.* layout, choice boxes/lists, buttons) to allow the user to choose different inputs and see the results
- identify the output needed *e.g.* types of graphs, statistics, animation
- initial design of 3D images, so that when data is entered there is a basic model that can then adapt to the data inputted.

*Award **[1 mark]** each for identifying a task up to a maximum of **[2 marks]**.*
*Award **[1 mark]** for each relevant description up to a maximum of **[2 marks]**.*

(c) Explain *two* advantages of using simulations to design products such as greenhouses. ***[4 marks]***

- while designing the product the designers and/or final users can get a real feeling of the final look of the greenhouse, *e.g.* 3D views that allow for rotations and different views of the product
- in simulation the parts used in the model such as equipment, furniture, hoses and fans may be added to the design and correct measurements to allow them to fit into the space available
- when the simulation runs, values like temperature and humidity can be simulated and the efficiency of the model tested before being built, allowing for changes
- simulation can be used several times making some changes to allow the model to be used for different users / different climatic environments
- simulations allow for projects to be presented to a board of investors to show the efficiency of the model designed.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of the advantages of how the simulation is useful to design products such as greenhouses but the answer may lack appropriate reasoning at the bottom end of the band. ***[2 marks]*** *for two ways identified or one described.* ***[3 marks]*** *for two ways described.*

[4 marks]
A clear, detailed explanation giving reasons for the two advantages of using simulations to design products such as greenhouses.

(d) To what extent are simulations such as this useful in enhancing the teaching and learning of a science subject? ***[10 marks]***

- students may use the simulation to try different options (not always present in their location) such as temperature, humidity, and observe the results in the data provided by the simulation
- extreme conditions may be simulated in the school lab without risk of damaging crops or spending money on plants or equipment
- data provided by the simulation may be exported and used by students to analyse results
- simulation provides immediate response to a change in the input data provided while a real situation would require waiting for days or weeks to see the results
- simulation may assume certain situations that are not in the knowledge of the students and this may provide incorrect information for the students
- simulations may not consider unexpected events like sudden weather changes or plagues for crops and results will not always be real
- some of the difficulties present in the real world may not be present in the simulation and students may not be aware of their existence (time needed to plant crops or to harvest fruits).

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

Area of impact: Politics and government

6. (a) Define the term *intellectual property*. ***[2 marks]***

- a product of the intellect with commercial value
- includes copyrighted property such as literary or artistic works
- includes ideational property, such as patents, appellations of origin, business methods and industrial processes.

[Source: www.academicresourcecenter.net/curriculum/glossary.aspx]

*Award **[1 mark]** for any of the above in a definition up to a maximum of **[2 marks]**.*

(b) Describe *two* services an ISP provides to Internet users. ***[4 marks]***

Answers may include:
- the main role of an ISP (Internet Service Provider) is to provide Internet service to subscribers (access to web pages, e-mail accounts are part of the same service – Internet access)
- an ISP has a gateway for subscribers to connect to and get access to the World Wide Web (WWW)
- with a dial-up connection purchasing an account from an ISP would give you one or more local numbers to call to gain access
- if you are a digital subscriber to an ISP providing broadband services you would pay for access to use their WWW gateway connecting directly through appropriate technology
- ISPs may also provide e-mail accounts for subscribers
- some ISPs also provide web page hosting with limited storage space
- they may provide protection in the form of antivirus software and firewalls
- maintenance and support are services provided by ISP providers (*e.g.* installation/provision of modem, set up of system, cabling *etc.*, problem solving if connection not working via phone or physical servicing / exchange of faulty system, filtering of undesirable or illegal sites).

*Award **[1 mark]** for identifying each service up to a maximum of **[2 marks]**.*
*Award **[1 mark]** for each relevant description of the service provided up to a maximum of **[2 marks]**.*

(c) Explain *two* ways a home computer network could be adversely affected by the use of file sharing services. ***[4 marks]***

- slowing down – if computers are heavily involved in downloading/uploading files from the file sharing service, other users will have less bandwidth to work and access the Internet, making the service slower
- downloading viruses, Trojan horses, worms, spyware, adware, browser hijackers – when sharing files users may download a file which is really a hidden malware and it may damage the computer or the network services
- if the program is open and there is no user downloading, it can still be used by outsiders to upload.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of how the home computer could be affected although the answer may lack appropriate reasoning at the bottom end of the band. ***[2 marks]*** *for two ways identified or one way described.* ***[3 marks]*** *for two ways described.*

[4 marks]
A clear, detailed explanation giving reasons of two ways how a home computer network could be adversely affected when using file sharing services.

(d) Discuss the implications for the music industry of governments regulating the use of P2P sites for file sharing. ***[10 marks]***

- users may stop downloading/sharing music from these sites and return to stores or sites where they have to pay for the music therefore providing them revenue
- will provide users with Internet sites to buy music legally – need to be present in the environment users belong
- musicians will receive payment when users download or buy their music
- users may now tend to copy files from other users rather than download them and pay for them
- music industry may be accused of promoting invasion of privacy by government as they need to look to be able to identify people who use P2P sites for file sharing
- new musicians may complain as they are now not able to share their songs to become known as artists.

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

Markband for all extended response questions.

Opinion discuss, evaluate, justify, recommend and to what extent	***0***	*No knowledge or understanding of IT issues and concepts or use of ITGS terminology.*
	1–2 marks	*A brief and generalized response with very little knowledge and understanding of IT issues and concepts with very little use of ITGS terminology.*
	3–5 marks	*A response that may include opinions, conclusions and/or judgments that are no more than unsubstantiated statements.* *The response will largely take the form of a description with a limited use of ITGS terminology and some knowledge and/or understanding of IT issues and/or concepts.* *If no reference is made to the information in the stimulus material, award up to* ***[3 marks]****.* *At the top end of this band the description is sustained.* *At the lower end of the band a tendency towards fragmentary, common sense points with very little use of ITGS terminology.*
	6–8 marks	*A response that demonstrates opinions, conclusions and/or judgments that have limited support.* *The response is a competent analysis that uses ITGS terminology appropriately. If there is no reference to ITGS terminology the candidate cannot access this markband.* *There is evidence that the response is linked to the information in the stimulus material.* *At the top end of the band the response is balanced, the response is explicitly linked to the information in the stimulus material and there may be an attempt to evaluate it in the form of largely unsubstantiated comments. There is also evidence of clear and coherent connections between the IT issues.* *At the lower end of the band the response may lack depth, be unbalanced or tend to be descriptive. There may be also implicit links to the information in the stimulus.*
	9–10 marks	*A detailed and balanced (at least one argument in favour and one against) response that demonstrates opinions, conclusions and/or judgments that are well supported and a clear understanding of the way IT facts and ideas are related.* *Thorough knowledge and understanding of IT issues and concepts.* *Appropriate use of ITGS terminology and application to specific situations throughout the response.* ***If there is no reference to ITGS terminology candidates cannot access this markband.*** *The response is explicitly linked to the information in the stimulus material.* *At the lower end of the band opinions, conclusions and/or judgment may be tentative.*

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