S1 ICT Practice Paper 1 | storage units, network bandwidth, binary, spreadsheets, image resolution, cloud backup

Junior Secondary Information Technology

S1 ICT practice paper with worked solutions: storage units, bandwidth, download time, binary encoding, spreadsheets, image resolution, cloud backup.

1. Storage units and file sizes (16 marks)

A student backs up photos on a 32 GB USB flash drive; each photo is 4.5 MB on average. He also has a 12 MB report that becomes 7.5 MB after compression.

#	Question	Answer and marking notes
1	(a) What is the maximum number of photos the drive can hold in theory? (whole number)	Answer: 32 GB = 32 x 1024 = 32768 MB, and 32768 / 4.5 = 7281 (rounded down), so at most 7281 photos fit.
2	(b) Find the compression ratio of the report as a percentage.	Answer: ratio = (12 - 7.5) / 12 x 100% = 4.5 / 12 x 100% = 37.5%.
3	(c) Convert 8000 MB into GB.	Answer: 1 GB = 1024 MB, so 8000 / 1024 = 7.8125 GB, about 7.81 GB.
4	(d) He also has 5 video files of 240 MB each. Find the total size in GB.	Answer: 5 x 240 = 1200 MB; 1200 / 1024 = 1.171875 GB, about 1.172 GB.

2. Network bandwidth and download time (16 marks)

A home broadband line runs at 24 Mbps (megabits per second). Note that 1 byte equals 8 bits.

#	Question	Answer and marking notes
5	(a) How many seconds are needed to download a 720 MB game update?	Answer: 720 MB = 720 x 8 = 5760 Mb; 5760 / 24 = 240 seconds, that is 4 minutes.
6	(b) How many minutes are needed to upload a 150 MB video at 5 Mbps?	Answer: 150 x 8 = 1200 Mb; 1200 / 5 = 240 seconds = 4 minutes.
7	(c) Backing up two 1.2 GB files over a 100 Mbps link takes how many seconds?	Answer: 2 x 1.2 GB = 2.4 GB = 2.4 x 1024 = 2457.6 MB = 19660.8 Mb; 19660.8 / 100 = 196.6 seconds, about 3.3 minutes.
8	(d) A monthly data plan allows 500 GB. What is the average allowance per day?	Answer: 500 / 30 = 16.67 GB, about 16.7 GB.

3. Binary numbers and character encoding (18 marks)

Computers store data in binary: each bit has only two states, 0 or 1, and characters are represented by codes of a fixed number of bits.

#	Question	Answer and marking notes
9	(a) Convert the binary number 1011 1010 into denary.	Answer: the place values are 128, 64, 32, 16, 8, 4, 2, 1; adding the positions holding 1 gives 128 + 32 + 16 + 8 + 2 = 186.

#	Question	Answer and marking notes
10	(b) Convert the binary number 1101 0011 into denary.	Answer: 128 + 64 + 16 + 2 + 1 = 211.
11	(c) How many distinct characters can 8-bit and 7-bit codes represent?	Answer: 8 bits give 2 to the power 8 = 256 combinations; 7 bits give 2 to the power 7 = 128, the size of standard ASCII.
12	(d) A 2-minute recording is encoded at 128 kbps. Find its size in MB.	Answer: 2 minutes = 120 seconds; 120 x 128 = 15360 kb; 15360 / 8 = 1920 KB; 1920 / 1024 = 1.875 MB.

4. Spreadsheet formulas and percentages (18 marks)

Test scores of one class are stored in cells B2 to B9: 45, 62, 58, 71, 90, 38, 55 and 80. The pass mark is 40.

#	Question	Answer and marking notes
13	(a) Write the formula for the mean and compute it.	Answer: the formula is =AVERAGE(B2:B9); the total is 499, so 499 / 8 = 62.375 marks.
14	(b) Use COUNTIF to find the pass rate as a percentage.	Answer: =COUNTIF(B2:B9,”>=40″)/COUNT(B2:B9) gives 7 / 8 = 87.5%.
15	(c) Find the range, that is the highest score minus the lowest.	Answer: the highest score is 90 and the lowest is 38, so the range is 90 - 38 = 52 marks.
16	(d) An item priced at 380 dollars is sold at 25% off. Find the price and the formula.	Answer: the formula is =380*0.75 or =380*(1-25%), giving a price of 285 dollars.

5. Image resolution and pixels (16 marks)

A full high definition photo has a resolution of 1920 x 1080 and uses 24-bit true colour, so each pixel takes 3 bytes (one each for red, green and blue).

#	Question	Answer and marking notes
17	(a) Find the total number of pixels in megapixels.	Answer: 1920 x 1080 = 2073600 pixels, about 2.07 megapixels.
18	(b) What is the uncompressed file size in MB?	Answer: 2073600 x 3 = 6220800 bytes; 6220800 / 1048576 = 5.93 MB.
19	(c) What is the size of an 800 x 600 image at 24-bit colour in MB?	Answer: 800 x 600 x 3 = 1440000 bytes; 1440000 / 1048576 = 1.37 MB.
20	(d) If the photo in (b) compresses to 1.4 MB, find the percentage of space saved.	Answer: saved = (5.93 - 1.4) / 5.93 x 100% = 76.4%.

6. Cloud backup capacity and cost (16 marks)

A student has 100 GB of free cloud space and has used 68 GB. He follows the rule of keeping three copies of his data, whose total size is 45 GB.

#	Question	Answer and marking notes
21	(a) How many 3.2 MB photos can the remaining space hold?	Answer: remaining 100 - 68 = 32 GB = 32768 MB; 32768 / 3.2 = 10240 photos.
22	(b) Following the three-copy rule, how much storage is needed in total?	Answer: 45 x 3 = 135 GB.
23	(c) How many hours does it take to upload 125 GB at 50 Mbps? (2 d.p.)	Answer: 125 x 1024 = 128000 MB = 1024000 Mb; 1024000 / 50 = 20480 seconds, about 5.69 hours, that is 5 hours 41 minutes.
24	(d) Storage costs 0.02 dollars per GB per month. Find the monthly cost for (b).	Answer: 0.02 x 135 = 2.70 dollars.