GATE Geomatics Engineering

Sample Paper – 3

Duration: 128 Minutes **Maximum Marks: 72**

Instructions

- This paper contains **46 questions** covering the core **Geomatics Engineering** subject of the GATE paper conducted by the IITs and IISc (General Aptitude and Engineering Mathematics are provided as separate papers).
- **Q1–Q20 carry 1 mark each** and **Q21–Q46 carry 2 marks each**, for a total of **72 marks**.
- Each question carries **negative marking of one-third of its allotted marks**: a wrong 1-mark question costs **0.33** and a wrong 2-mark question costs **0.67**. Unattempted questions carry no penalty.
- Every question here is a single-correct **MCQ**. The real GATE paper also has Multiple Select (MSQ) and Numerical Answer Type (NAT) questions, and **those carry no negative marking**.
- Attempt this paper in one timed sitting of about **128 minutes**, the share this core subject earns at GATE's overall pace of 180 minutes for 65 questions. Unless stated otherwise take the speed of light $c = 3 \times 10^8$ m/s and the coefficient of thermal expansion of steel $\alpha = 11.7 \times 10^{-6}\ ^\circ\text{C}^{-1}$.

Principles of Surveying and Error Theory

Q1. The standard deviation of a single reading of a horizontal distance with a given EDM is ± 0.024 m. If 9 equally reliable readings are averaged, the standard error of the arithmetic mean $(\sigma/\sqrt{n})$ is: **[1 mark]**

(A) ± 0.024 m

(B) ± 0.072 m

(C) ± 0.012 m

(D) ± 0.008 m

Q2. In least-squares adjustment the weight of an observation is taken inversely proportional to the square of its standard error. Two length measurements have standard errors ± 2 mm and ± 4 mm. The ratio of their weights $w_1 : w_2$ is: **[1 mark]**

(A) $2 : 1$

(B) $4 : 1$

(C) $1 : 2$

(D) $1 : 4$

Q3. A survey line is measured in two independent sections whose standard errors are ± 6 mm and ± 8 mm. Taking the errors as combining in quadrature, the standard error of the total length is: **[1 mark]**

(A) ± 14 mm

(B) ± 2 mm

(C) ± 10 mm

(D) ± 100 mm

Q4. In the method of least squares, the most probable values of the unknowns are those that make which of the following a minimum? **[1 mark]**

(A) the algebraic sum of the observations

(B) the largest single residual

(C) the algebraic sum of the residuals

(D) the sum of the squares of the (weighted) residuals

Q5. The probable error of a single observation equals 0.6745 times its standard deviation. If the standard deviation of a set of angle observations is $\pm 3.0''$, the probable error of a single observation is nearest to: **[1 mark]**

(A) $\pm 4.4''$

(B) $\pm 2.0''$

(C) $\pm 3.0''$

(D) $\pm 0.7''$

Q6. Accidental (random) errors in a large set of observations follow a normal (Gaussian) distribution. Which statement about them is correct? **[1 mark]**

(A) large errors occur just as frequently as small errors

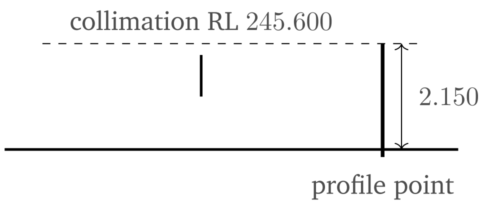
(B) positive errors are far more common than negative errors

(C) small errors are more frequent than large ones, and equal positive and negative errors are equally likely

(D) every error carries the same magnitude and sign

Distance Measurement, Levelling and Contouring

Q7. During profile levelling the height of collimation (line of sight) is at RL 245.600 m. An intermediate staff reading of 2.150 m is taken on the profile, as shown. The reduced level of that point is: **[1 mark]**



(A) 243.450 m

(B) 247.750 m

(C) 245.600 m

(D) 244.450 m

Q8. A distance of 200 m is measured along a uniform slope, the two ends differing in level by 8 m. Using the approximate slope correction $-\dfrac{h^2}{2L}$, the correction to reduce the length to the horizontal is: **[1 mark]**

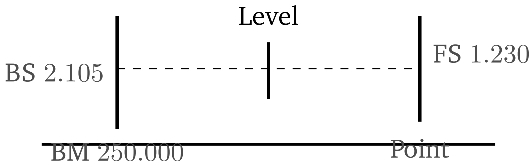
(A) -0.32 m

(B) -0.08 m

(C) -0.16 m

(D) -0.04 m

Q9. In the differential-levelling set-up shown, the backsight on a benchmark of RL 250.000 m is 2.105 m and the foresight to the next point is 1.230 m. The reduced level of the forepoint is: **[1 mark]**



(A) 250.000 m

(B) 250.875 m

(C) 249.125 m

(D) 253.335 m

Q10. In a page of profile levelling the sum of all backsights is 8.455 m and the sum of all foresights is 6.230 m. The change in reduced level from the first to the last point ($\sum$ BS $-\sum$ FS) is: **[1 mark]**

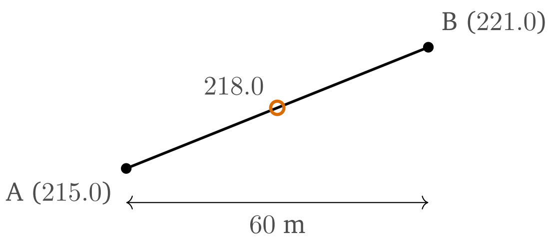
(A) $+14.685$ m

(B) $+2.225$ m

(C) -2.225 m

(D) $+1.225$ m

Q11. Points A and B lie 60 m apart on a uniform slope. A has RL 215.0 m and B has RL 221.0 m, as shown. By linear interpolation the horizontal distance from A to the point where the 218.0 m contour crosses AB is: **[1 mark]**



(A) 10 m

(B) 20 m

(C) 30 m

(D) 45 m

Q12. On a map of scale 1:25,000 with a contour interval of 10 m, two adjacent contours are 8 mm apart on the paper. The ground slope (gradient) between them is: **[1 mark]**

(A) 1 in 20

(B) 1 in 8

(C) 1 in 25

(D) 1 in 200

Theodolite, Traverse and Triangulation

Q13. The fore bearing (whole-circle bearing) of a line PQ is $130°45'$. The back bearing of the line is: **[1 mark]**

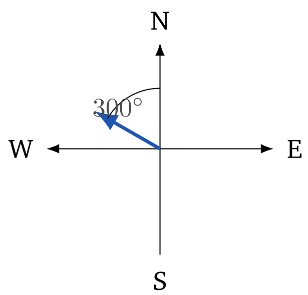
(A) $130°45'$

(B) $49°15'$

(C) $229°15'$

(D) $310°45'$

Q14. The whole-circle bearing of a survey line is $300°$, as shown on the compass diagram. Its reduced (quadrantal) bearing is: **[1 mark]**



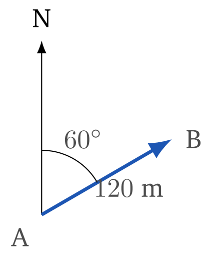
(A) N60°E

(B) S60°W

(C) S60°E

(D) N60°W

Q15. A traverse line AB of length 120 m has a whole-circle bearing of $60°$, as shown. Its latitude ($L\cos\theta$) and departure ($L\sin\theta$) are respectively: **[1 mark]**



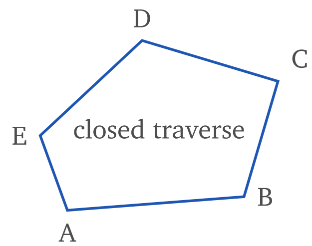
(A) 103.9 m N, 60.0 m E

(B) 60.0 m N, 103.9 m E

(C) 60.0 m N, 60.0 m E

(D) 103.9 m N, 103.9 m E

Q16. A closed traverse (shown schematically) has a total latitude misclosure of $+0.6$ m and a total departure misclosure of $+0.8$ m. The linear closing error of the traverse is: **[1 mark]**



(A) 1.4 m

(B) 0.2 m

(C) 1.0 m

(D) 0.7 m

Q17. For a closed polygon traverse having 8 sides, the theoretical sum of the interior angles, given by $(2n-4)\times 90°$, is: **[1 mark]**

(A) 720°

(B) 900°

(C) 1080°

(D) 1260°

Q18. While balancing a traverse in Gale's table by Bowditch's (compass) rule, the correction applied to the latitude or departure of any side is proportional to: **[1 mark]**

(A) the departure of that side

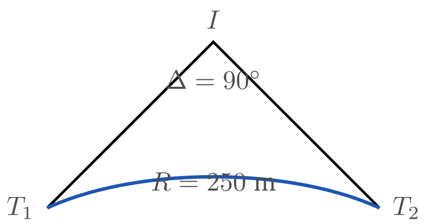
(B) the length of that side

(C) the square of the length of that side

(D) the sine of the bearing of that side

Curves, Tacheometry and Field Astronomy

Q19. A simple circular curve of radius $R = 250$ m has a deflection angle $\Delta = 90^\circ$ between its tangents, as shown. The tangent length ($T = R\tan(\Delta/2)$) is: **[1 mark]**



(A) 125 m

(B) 250 m

(C) 500 m

(D) 353.6 m

Q20. A simple circular curve of radius 300 m subtends a deflection angle of 60°. The length of the curve, $L = \dfrac{\pi R \Delta}{180^\circ}$, is: **[1 mark]**

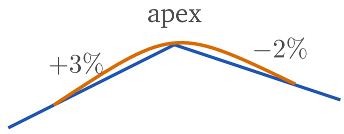
(A) 300 m

(B) 100 m

(C) 628.3 m

(D) 314.2 m

Q21. A vertical (summit) curve joins an up-gradient of $+3\%$ with a down-gradient of -2%, as shown. The algebraic difference (total change) of grade used in designing the curve is: **[2 marks]**



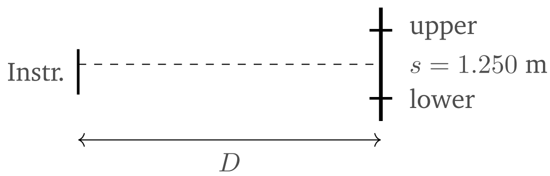
(A) 1%

(B) 6%

(C) 5%

(D) 0.6%

Q22. In a tacheometric observation with an anallactic telescope (multiplying constant $k = 100$, additive constant $C = 0$) the staff intercept is 1.250 m with the line of sight horizontal, as shown. The horizontal distance to the staff is: **[2 marks]**



(A) 125 m

(B) 1250 m

(C) 12.5 m

(D) 100 m

Q23. A tacheometer ($k = 100$, $C = 0$) reads a staff intercept of 1.500 m with the line of sight inclined at 6° to the horizontal. The horizontal distance, $D = k\, s \cos^2 \theta$, is nearest to: **[2 marks]**

(A) 150 m

(B) 100 m

(C) 135 m

(D) 148.4 m

Q24. In field astronomy the altitude of the celestial pole above the horizon equals the observer's latitude. For a station at latitude $45°$N, the altitude of the north celestial pole is: **[2 marks]**

(A) $55°$

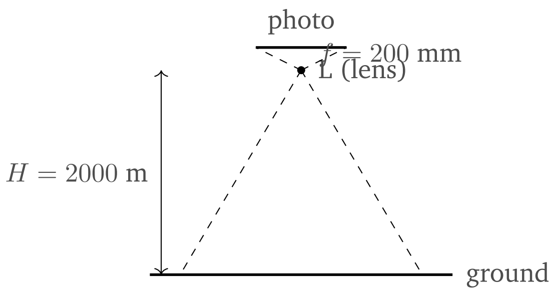
(B) $45°$

(C) $90°$

(D) $0°$

Photogrammetry

Q25. A vertical aerial photograph is taken with a camera of focal length 200 mm from a flying height of 2000 m above flat ground, as shown. The scale of the photograph (f/H) is: **[2 marks]**



(A) 1:10,000

(B) 1:2000

(C) 1:20,000

(D) 1:1000

Q26. A vertical photograph has a scale of 1:6000 and was taken with a camera of focal length 150 mm. The flying height above the ground datum is: **[2 marks]**

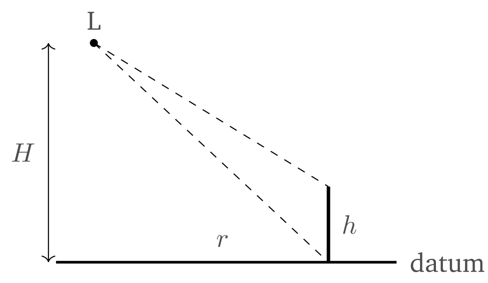
(A) 900 m

(B) 40,000 m

(C) 1200 m

(D) 6000 m

Q27. On a vertical photograph the relief displacement of the top of a vertical object is $d = \dfrac{r\,h}{H}$. For radial distance $r = 100$ mm, object height $h = 120$ m and flying height $H = 2400$ m (see figure), the relief displacement is: **[2 marks]**



(A) 1 mm

(B) 2 mm

(C) 4 mm

(D) 5 mm

Q28. A straight line on the ground is 60 mm long on a vertical photograph of scale 1:12,000. The corresponding ground length of the line is: **[2 marks]**

(A) 500 m

(B) 72 m

(C) 720 m

(D) 7200 m

Q29. In a normal-angle aerial mapping camera used for topographic surveys, a commonly adopted focal length of the lens cone is about: **[2 marks]**

(A) 152 mm

(B) 15 mm

(C) 1500 mm

(D) 50 m

Q30. A vertical photograph of scale 1:5000 shows a rectangular field measuring 50 mm $\times$ 40 mm on the print. The ground area of the field is: **[2 marks]**

(A) 2.5 ha

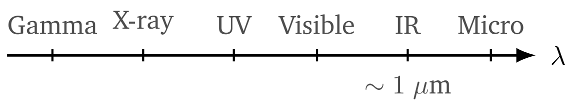
(B) 5 ha

(C) 50 ha

(D) 0.5 ha

Remote Sensing

Q31. Electromagnetic radiation of frequency 3×10^{14} Hz travels in vacuum at $c = 3 \times 10^8$ m/s. Its wavelength ($\lambda = c/f$), located on the spectrum below, is: **[2 marks]**



(A) 3 μm

(B) 0.3 μm

(C) 1 μm

(D) 10 μm

Q32. Which of the following is an example of an *active* remote-sensing system? **[2 marks]**

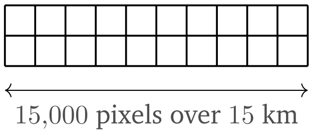
(A) an aerial photographic camera

(B) a synthetic aperture radar (SAR)

(C) a passive multispectral optical scanner

(D) a thermal infrared radiometer

Q33. A pushbroom optical sensor images a ground swath of 15 km using 15,000 detector elements across the line, as sketched. The ground sampling distance (spatial resolution) per pixel is: **[2 marks]**



(A) 1 m

(B) 10 m

(C) 0.1 m

(D) 15 m

Q34. Radar and LiDAR are classified as *active* sensors mainly because they: **[2 marks]**

(A) detect only reflected sunlight from the target

(B) generate and transmit their own energy and record the reflected or backscattered return

(C) measure only the Earth's naturally emitted thermal radiation

(D) operate only within the visible band of the spectrum

Q35. The number of days a satellite takes to revisit and re-image the same area on the ground is described by its: **[2 marks]**

(A) spectral resolution

(B) spatial resolution

(C) radiometric resolution

(D) temporal resolution

Q36. A satellite sensor records each pixel at a radiometric resolution of 10 bits. The number of discrete grey levels it can represent is: **[2 marks]**

(A) 1024

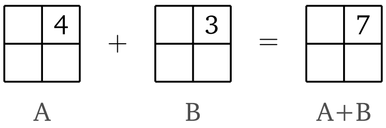
(B) 256

(C) 512

(D) 100

Geographic Information Systems

Q37. Two raster layers A and B are combined cell by cell in map algebra. If a cell holds 4 in layer A and 3 in the coincident cell of layer B, the output cell is $4 + 3 = 7$ (see grids). This is an example of a: [2 marks]



(A) a local (cell-by-cell) map-algebra operation

(B) a focal (neighbourhood) operation

(C) a zonal operation over a defined region

(D) a global operation over the whole raster

Q38. A single-band raster layer has 2048 rows and 2048 columns, with each cell stored as one byte. The uncompressed storage size of the layer is nearest to: [2 marks]

(A) 1 MB

(B) 2 MB

(C) 16 MB

(D) 4 MB

Q39. In raster map algebra, a *focal* (neighbourhood) function computes each output cell from: [2 marks]

(A) a single input cell at the same location

(B) every cell in the entire raster

(C) only cells that share the same zone value

(D) the cell together with its surrounding neighbours in a defined window

Q40. Grouping a raster of continuous slope values into three classes (1 = gentle, 2 = moderate, 3 = steep) is best described as: [2 marks]

(A) a buffer operation

(B) a reclassification (local) operation

(C) a network shortest-path analysis

(D) a spatial interpolation

Q41. Computing a new raster NDVI $= \dfrac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$ from two input bands is an example of: **[2 marks]**

(A) a vector polygon overlay

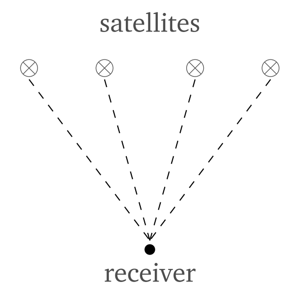
(B) a network routing operation

(C) map algebra (band arithmetic) on rasters

(D) address geocoding

GNSS, Cartography and Map Projections

Q42. For a GNSS receiver to compute a three-dimensional position (X, Y, Z) together with its own clock error, the minimum number of satellites that must be simultaneously tracked is (see geometry): **[2 marks]**



(A) 3

(B) 5

(C) 6

(D) 4

Q43. A GNSS signal takes 0.06 s to travel from a satellite to a ground receiver. Taking the speed of light as 3×10^8 m/s, the (approximate) pseudorange to the satellite is: **[2 marks]**

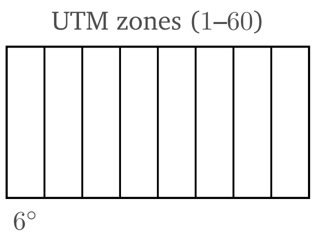
(A) 18,000 km

(B) 1800 km

(C) 180 km

(D) 300 km

Q44. The Universal Transverse Mercator (UTM) system numbers its $6°$ longitudinal zones 1 to 60 starting from $180°$W (see graticule). For a station at longitude $78°$E, using zone $= \left\lfloor \frac{\lambda+180°}{6°} \right\rfloor + 1$, the UTM zone number is: **[2 marks]**



(A) 44

(B) 43

(C) 45

(D) 42

Q45. A conformal (Helmert, four-parameter similarity) two-dimensional coordinate transformation between two planar systems consists of: **[2 marks]**

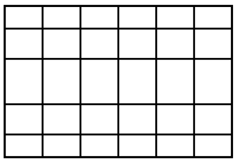
(A) a single translation only

(B) a single rotation only

(C) two translations, one rotation and one uniform scale factor

(D) a full affine transformation with six independent parameters

Q46. The UTM projection is a form of the Transverse Mercator projection. Like all Mercator variants, and as illustrated by its right-angled graticule, it is: **[2 marks]**



meridians and parallels cross at right angles

(A) conformal, preserving local angles and the shapes of small features

(B) equal-area, preserving true area everywhere

(C) equidistant, preserving true distance along every line

(D) azimuthal, preserving true directions from a central point

Detailed Solutions

Q1.

Solution

Concept – standard error of the mean: Averaging n equally reliable observations reduces the scatter of the mean by a factor $\sqrt{n}$, so $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$.

Step 1 – write the standard deviation of a single reading: $\sigma = 0.024$ m

Step 2 – write the number of readings: $n = 9$

Step 3 – take the square root of n: $\sqrt{9} = 3$

Step 4 – divide the single-reading error by $\sqrt{n}$: $\sigma_{\bar{x}} = \frac{0.024}{3}$

Step 5 – evaluate: $\sigma_{\bar{x}} = 0.008$ m

Why the other options are wrong:

- A keeps the single-reading error unchanged (no averaging benefit).
- B multiplies by 3 instead of dividing.
- C divides by 2 rather than by $\sqrt{9} = 3$.

Final Answer: $\sigma_{\bar{x}} = \pm 0.008 \text{ m} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q1

Q2.

Solution

Concept – weight from standard error: In least-squares work the weight of an observation is inversely proportional to the square of its standard error, $w \propto \frac{1}{\sigma^2}$.

Step 1 – write each weight in terms of its error: $w_1 \propto \frac{1}{2^2} = \frac{1}{4}$

$w_2 \propto \frac{1}{4^2} = \frac{1}{16}$

Step 2 – form the ratio of weights: $\frac{w_1}{w_2} = \frac{1/4}{1/16}$

Step 3 – divide the fractions: $\frac{w_1}{w_2} = \frac{1}{4} \times \frac{16}{1}$

Step 4 – simplify: $\frac{w_1}{w_2} = 4$

Step 5 – state the ratio: $w_1 : w_2 = 4 : 1$

Why the other options are wrong:

- A comes from using $1/\sigma$ rather than $1/\sigma^2$.
- C and D invert the ratio (they weight the poorer observation more).

Final Answer: $w_1 : w_2 = 4 : 1 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept – propagation of error in a sum: When independent quantities are added, their standard errors combine in quadrature: $\sigma = \sqrt{\sigma_1^2 + \sigma_2^2}$.

Step 1 – square the first component error: $\sigma_1^2 = 6^2 = 36$

Step 2 – square the second component error: $\sigma_2^2 = 8^2 = 64$

Step 3 – add the squares: $36 + 64 = 100$

Step 4 – take the square root: $\sigma = \sqrt{100}$

$\sigma = 10$ mm

Why the other options are wrong:

- A (14) adds the errors directly instead of in quadrature.
- B (2) subtracts them.
- D (100) forgets to take the square root.

Final Answer: $\sigma = \pm 10 \text{ mm} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q3

Q4.

Solution

Concept – the least-squares criterion: The principle of least squares states that the most probable values are those for which the sum of the squares of the (weighted) residuals is a minimum.

Step 1 – define the residual: A residual v_i is the difference between an observation and its adjusted (most probable) value.

Step 2 – state the objective function: The adjustment minimises $\sum w_i v_i^2$.

Step 3 – explain why squares: Squaring makes every residual positive and penalises large residuals more heavily, giving a unique, stable solution.

Why the other options are wrong:

- A: the sum of observations is not minimised; it is a fixed data total.
- B: minimising only the largest residual is the minimax criterion, not least squares.
- C: the simple sum of residuals can be zero for many different fits, so it cannot fix the unknowns.

Final Answer: sum of the squares of the (weighted) residuals $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q4

Q5.

Solution

Concept – probable error of a single observation: The probable error is the band about the mean within which half the errors are expected to fall, $E_s = 0.6745\,\sigma$.

Step 1 – write the standard deviation: $\sigma = 3.0''$

Step 2 – multiply by the constant 0.6745**:** $E_s = 0.6745 \times 3.0$

Step 3 – evaluate: $E_s = 2.0235''$

Step 4 – round to the nearest option: $E_s \approx 2.0''$

Why the other options are wrong:

- A uses a factor near 1.48 (the inverse constant).
- C simply repeats the standard deviation.
- D uses the constant alone without the $3.0''$.

Final Answer: $E_s \approx \pm 2.0'' \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q5

Q6.

Solution

Concept – the normal distribution of accidental errors: Random errors obey a bell-shaped (Gaussian) law with three well-known properties.

Step 1 – frequency versus size: Small errors occur more often than large errors; very large errors are rare.

Step 2 – symmetry of sign: Positive and negative errors of the same magnitude are equally likely, so the curve is symmetric about zero.

Step 3 – limiting behaviour: Extremely large errors are treated as effectively impossible and are rejected as blunders.

Why the other options are wrong:

- A contradicts the peaked shape (large errors are rarer, not equally frequent).
- B breaks the symmetry that defines the normal law.
- D describes a systematic error, not a random one.

Final Answer: small errors are more frequent and equal $\pm$ errors are equally likely $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q6

Q7.

Solution

Concept – reduced level by the height-of-instrument method: RL of point $=$ height of collimation $-$ staff reading.

Step 1 – write the height of collimation: HI $= 245.600$ m

Step 2 – write the intermediate staff reading: reading $= 2.150$ m

Step 3 – subtract the reading from the collimation level: RL $= 245.600 - 2.150$

Step 4 – evaluate: RL $= 243.450$ m

Step 5 – sense check: The staff reads a positive value, so the point sits below the line of sight; $243.450 < 245.600$, as expected.

Why the other options are wrong:

- B adds the reading instead of subtracting it.
- C forgets the staff reading altogether.
- D subtracts only part of the reading.

Final Answer: RL $= 243.450$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept – slope (reduction to horizontal) correction: For a small height difference the correction is $C_s = -\dfrac{h^2}{2L}$, always subtractive.

Step 1 – square the height difference: $h^2 = 8^2 = 64$

Step 2 – form the denominator: $2L = 2 \times 200 = 400$

Step 3 – divide: $\dfrac{h^2}{2L} = \dfrac{64}{400}$

$$\frac{h^2}{2L} = 0.16$$

Step 4 – apply the negative sign: $C_s = -0.16\ \text{m}$

Why the other options are wrong:

- A doubles the correct value (uses L instead of $2L$).
- B and D use wrong squares or denominators.

Final Answer: $C_s = -0.16\ \text{m} \Rightarrow \boxed{\text{C}}$

Answer: (C) **Go Back to Q8**

Q9.

Solution

Concept – reduced level from backsight and foresight: $\text{RL of forepoint} = \text{RL of BM} + \text{BS} - \text{FS}$.

Step 1 – add the backsight to the benchmark RL (this gives the line of collimation): $250.000 + 2.105 = 252.105\ \text{m}$

Step 2 – subtract the foresight: $252.105 - 1.230 = 250.875\ \text{m}$

Step 3 – sense check: The backsight (2.105) exceeds the foresight (1.230), so the ground has risen; $250.875 > 250.000$, which is consistent.

Why the other options are wrong:

- A ignores both readings.
- C subtracts BS and adds FS (signs swapped).
- D adds both readings to the RL.

Final Answer: $\text{RL} = 250.875\ \text{m} \Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q9**

Q10.

Solution

Concept – arithmetic check of a level page: Over a run of levelling, the change in reduced level from first to last point equals $\sum \text{BS} - \sum \text{FS}$.

Step 1 – write the sum of backsights: $\sum \text{BS} = 8.455$ m

Step 2 – write the sum of foresights: $\sum \text{FS} = 6.230$ m

Step 3 – subtract: $8.455 - 6.230 = 2.225$ m

Step 4 – interpret the sign: The result is positive, so the last point is 2.225 m higher than the first (a net rise).

Why the other options are wrong:

- A adds the two sums instead of subtracting.
- C has the wrong sign (implies a fall).
- D is an arithmetic slip.

Final Answer: $\Delta\text{RL} = +2.225 \text{ m} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept – linear interpolation of a contour on a uniform slope: The horizontal distance to a given level is proportional to its height above the lower point.

Step 1 – total rise from A to B: $221.0 - 215.0 = 6.0$ m

Step 2 – rise from A up to the contour: $218.0 - 215.0 = 3.0$ m

Step 3 – form the proportion of the total distance: $\dfrac{3.0}{6.0} = 0.5$

Step 4 – multiply by the horizontal distance AB: $d = 0.5 \times 60$

$d = 30$ m

Why the other options are wrong:

- A and B use the wrong height ratio.
- D places the contour past the mid-point, inconsistent with a rise of exactly half the interval.

Final Answer: $d = 30$ m from A $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept – ground slope from contour spacing: slope $= \dfrac{\text{contour interval}}{\text{horizontal ground distance between contours}}$.

Step 1 – convert the map spacing to a ground distance using the scale: $8 \text{ mm} \times 25{,}000 = 200{,}000 \text{ mm}$

Step 2 – convert to metres: $200{,}000 \text{ mm} = 200 \text{ m}$

Step 3 – form the slope ratio: slope $= \dfrac{10 \text{ m}}{200 \text{ m}}$

Step 4 – reduce to 1 in n: $\dfrac{10}{200} = \dfrac{1}{20}$

Why the other options are wrong:

- B and C ignore the scale conversion.
- D quotes the ground distance (200 m) as if it were the slope.

Final Answer: slope $=$ 1 in 20 $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q12

Q13.

Solution

Concept – back bearing from fore bearing: Back bearing $=$ fore bearing $\pm 180°$; add $180°$ when the fore bearing is below $180°$.

Step 1 – note the fore bearing: $\text{FB} = 130°45'$

Step 2 – since it is less than $180°$, add $180°$: $\text{BB} = 130°45' + 180°$

Step 3 – add the degrees: $130° + 180° = 310°$

Step 4 – carry the minutes: $\text{BB} = 310°45'$

Why the other options are wrong:

- A repeats the fore bearing.
- B and C come from subtracting instead of adding $180°$ or from mishandling the minutes.

Final Answer: $\text{BB} = 310°45' \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept – whole-circle to reduced bearing: A WCB between $270°$ and $360°$ lies in the fourth (north-west) quadrant, with RB $= 360° - \text{WCB}$ measured from north towards west.

Step 1 – identify the quadrant: $300°$ is between $270°$ and $360°$, i.e. the NW quadrant.

Step 2 – subtract from $360°$: $360° - 300° = 60°$

Step 3 – attach the quadrant letters: Measured from north towards west, the bearing is N$60°$W.

Why the other options are wrong:

- A places the line in the NE quadrant (wrong side).
- B and C use south as the reference, which applies to WCBs between $90°$ and $270°$.

Final Answer: N$60°$W $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q14

Q15.

Solution

Concept – latitude and departure of a line: Latitude $= L\cos\theta$ (N–S component) and Departure $= L\sin\theta$ (E–W component), with θ the bearing measured from north.

Step 1 – compute the latitude: Lat $= 120\cos 60°$

Lat $= 120 \times 0.5$

Lat $= 60.0$ m (northerly)

Step 2 – compute the departure: Dep $= 120\sin 60°$

Dep $= 120 \times 0.8660$

Dep $= 103.9$ m (easterly)

Why the other options are wrong:

- A swaps the latitude and departure (uses sin for N–S).
- C and D use $60°$ or 103.9 for both components.

Final Answer: 60.0 m N, 103.9 m E $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q15

Q16.

Solution

Concept – linear closing error of a traverse: $e = \sqrt{(\sum L)^2 + (\sum D)^2}$, where $\sum L$ and $\sum D$ are the total latitude and departure misclosures.

Step 1 – square the latitude misclosure: $(\sum L)^2 = (0.6)^2 = 0.36$

Step 2 – square the departure misclosure: $(\sum D)^2 = (0.8)^2 = 0.64$

Step 3 – add: $0.36 + 0.64 = 1.00$

Step 4 – take the square root: $e = \sqrt{1.00}$

$e = 1.0$ m

Why the other options are wrong:

- A (1.4) adds the misclosures directly.
- B (0.2) subtracts them.
- D (0.7) is an unrelated value.

Final Answer: $e = 1.0$ m $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q16

Q17.

Solution

Concept – sum of interior angles of a closed polygon: For a closed traverse of n sides the interior angles sum to $(2n - 4) \times 90°$.

Step 1 – substitute $n = 8$: $(2 \times 8 - 4) \times 90°$

Step 2 – evaluate inside the bracket: $(16 - 4) = 12$

Step 3 – multiply: $12 \times 90° = 1080°$

Why the other options are wrong:

- A $(720°)$ is the value for $n = 6$.
- B $(900°)$ is for $n = 7$.
- D $(1260°)$ is for $n = 9$.

Final Answer: $1080° \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q17

Q18.

Solution

Concept – Bowditch's (compass) rule: Bowditch's rule distributes the misclosure in proportion to the length of each side, on the assumption that angular and linear errors are of the same order.

Step 1 – write the correction formula: correction to a side $=$ total misclosure $\times \dfrac{\text{length of that side}}{\text{perimeter}}$.

Step 2 – read off the proportionality: The correction is directly proportional to the length of that side.

Why the other options are wrong:

- A and D name the departure or the bearing sine, which appear in the transit rule, not Bowditch's.
- C uses the square of the length, which no standard balancing rule uses.

Final Answer: the length of that side $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept – tangent length of a simple curve: $T = R\tan\left(\dfrac{\Delta}{2}\right)$.

Step 1 – halve the deflection angle: $\dfrac{\Delta}{2} = \dfrac{90^\circ}{2} = 45^\circ$

Step 2 – take the tangent: $\tan 45^\circ = 1$

Step 3 – multiply by the radius: $T = 250 \times 1$

$T = 250$ m

Why the other options are wrong:

- A halves the radius.
- C doubles it.
- D uses $\tan(\Delta)$ with the wrong angle.

Final Answer: $T = 250$ m $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q19

Q20.

Solution

Concept – length of a circular curve: $L = \dfrac{\pi R\Delta}{180^\circ}$, with Δ in degrees.

Step 1 – substitute the values: $L = \dfrac{\pi \times 300 \times 60}{180}$

Step 2 – simplify the numeric factor: $\dfrac{300 \times 60}{180} = \dfrac{18000}{180} = 100$

Step 3 – multiply by π: $L = 100\pi$

Step 4 – evaluate: $L = 314.16 \text{ m} \approx 314.2 \text{ m}$

Why the other options are wrong:

- A and B drop the factor π.
- C uses a 120° deflection (double the given angle).

Final Answer: $L \approx 314.2 \text{ m} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept – algebraic difference of grades on a vertical curve: The change of grade A used in vertical-curve design is $A = g_1 - g_2$, where up-grades are taken positive and down-grades negative.

Step 1 – write the two grades with signs: $g_1 = +3\%$, $g_2 = -2\%$

Step 2 – form the algebraic difference: $A = (+3) - (-2)$

Step 3 – remove the double sign: $A = 3 + 2$

Step 4 – add: $A = 5\%$

Step 5 – interpret: A 5% change of grade is the deviation angle the summit curve must smooth out.

Why the other options are wrong:

- A subtracts the magnitudes $(3 - 2)$, ignoring the sign of the down-grade.
- B adds an extra 1%.
- D misplaces the decimal point.

Final Answer: $A = 5\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q21

Q22.

Solution

Concept – horizontal distance in stadia tacheometry (horizontal sight): With the line of sight horizontal, $D = k\,s + C$.

Step 1 – list the constants and intercept: $k = 100$, $C = 0$, $s = 1.250$ m

Step 2 – multiply the multiplying constant by the intercept: $k\,s = 100 \times 1.250$

$k\,s = 125$ m

Step 3 – add the additive constant: $D = 125 + 0$

$D = 125$ m

Why the other options are wrong:

- B multiplies by 1000 (unit slip).
- C divides by 10.
- D ignores the intercept and quotes the constant k.

Final Answer: $D = 125 \text{ m} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q22

Q23.

Solution

Concept – horizontal distance for an inclined sight: $D = k\,s\cos^2\theta + C\cos\theta$; with $C = 0$ this is $D = k\,s\cos^2\theta$.

Step 1 – write the values: $k = 100$, $s = 1.500$ m, $\theta = 6°$

Step 2 – find the cosine: $\cos 6° = 0.99452$

Step 3 – square it: $\cos^2 6° = 0.98907$

Step 4 – form $k\,s$: $k\,s = 100 \times 1.500 = 150$

Step 5 – multiply by $\cos^2\theta$: $D = 150 \times 0.98907$

$D = 148.36 \text{ m} \approx 148.4$ m

Why the other options are wrong:

- A ignores the inclination ($\cos^2\theta$ factor).
- B uses the wrong intercept.
- C applies too large a reduction (as if θ were much larger).

Final Answer: $D \approx 148.4$ m $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q23

Q24.

Solution

Concept – altitude of the celestial pole: For an observer, the altitude of the celestial pole above the horizon equals the observer's latitude.

Step 1 – state the rule: altitude of pole = latitude

Step 2 – substitute the latitude: altitude $= 45^\circ$

Step 3 – interpret: At latitude 45°N the north celestial pole stands exactly 45° above the northern horizon.

Why the other options are wrong:

- A (55°) is the co-latitude (90° – latitude), which is the zenith distance of the pole, not its altitude.
- C (90°) holds only at the geographic pole.
- D (0°) holds only on the equator.

Final Answer: altitude $= 45^\circ \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q24

Q25.

Solution

Concept – scale of a vertical photograph: Scale $= \dfrac{f}{H}$, with the focal length f and flying height H in the same unit.

Step 1 – convert the focal length to metres: $f = 200$ mm $= 0.200$ m

Step 2 – write the flying height: $H = 2000$ m

Step 3 – form the ratio: Scale $= \dfrac{0.200}{2000}$

Step 4 – simplify: Scale $= \dfrac{1}{10{,}000}$

Why the other options are wrong:

- B and D come from unit slips in f.
- C uses $H = 4000$ m.

Final Answer: scale $= 1{:}10{,}000 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q25

Q26.

Solution

Concept – flying height from scale and focal length: From Scale $= \dfrac{f}{H}$ we get $H = f \times (\text{scale denominator})$.

Step 1 – convert the focal length to metres: $f = 150$ mm $= 0.150$ m

Step 2 – read the scale denominator: denominator $= 6000$

Step 3 – multiply: $H = 0.150 \times 6000$

Step 4 – evaluate: $H = 900$ m

Why the other options are wrong:

- B keeps f in millimetres without converting.
- C uses $f = 200$ mm.
- D simply repeats the scale denominator.

Final Answer: $H = 900$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q26

Q27.

Solution

Concept – relief displacement: On a vertical photograph, $d = \dfrac{r\,h}{H}$, where r is the radial distance of the image, h the object height and H the flying height.

Step 1 – list the quantities: $r = 100$ mm, $h = 120$ m, $H = 2400$ m

Step 2 – form the ratio h/H: $\dfrac{h}{H} = \dfrac{120}{2400} = 0.05$

Step 3 – multiply by the radial distance: $d = 100 \times 0.05$

Step 4 – evaluate: $d = 5$ mm

Why the other options are wrong:

- A, B and C follow from mis-forming the ratio h/H (e.g. using $H = 12{,}000$ or 6000).

Final Answer: $d = 5$ mm $\Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q27**

Q28.

Solution

Concept – ground length from photo length: ground length $=$ photo length $\times$ (scale denominator).

Step 1 – write the photo length: $\ell = 60$ mm

Step 2 – multiply by the scale denominator: $L = 60 \times 12{,}000$

$L = 720{,}000$ mm

Step 3 – convert to metres: $720{,}000$ mm $= 720$ m

Why the other options are wrong:

- A is unrelated to the given numbers.
- B forgets the scale multiplication.
- D is off by a factor of ten in the conversion.

Final Answer: $L = 720$ m $\Rightarrow \boxed{\text{C}}$

Answer: (C) **Go Back to Q28**

Q29.

Solution

Concept – focal length of a normal-angle mapping camera: Standard aerial mapping cameras are built around a few nominal focal lengths; the classic "normal-angle" cone has a focal length of about 6 inches.

Step 1 – convert 6 inches to millimetres: $6 \times 25.4 = 152.4$ mm

Step 2 – round to the nominal value: $f \approx 152$ mm

Step 3 – note the family: Wide-angle cones use about 88–90 mm and super-wide about 150 mm variants, but the normal-angle standard is 152 mm.

Why the other options are wrong:

- B (15 mm) is far too short for a metric mapping camera.
- C (1500 mm) and D (50 m) are wildly too long for an airborne frame camera.

Final Answer: $f \approx 152$ mm $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q29

Q30.

Solution

Concept – ground area from a photograph: Convert each side to a ground length using the scale, then multiply; 1 ha $= 10{,}000$ m^2.

Step 1 – ground length of the first side: 50 mm $\times 5000 = 250{,}000$ mm $= 250$ m

Step 2 – ground length of the second side: 40 mm $\times 5000 = 200{,}000$ mm $= 200$ m

Step 3 – multiply to get the area: $A = 250 \times 200$

$A = 50{,}000$ m^2

Step 4 – convert to hectares: $A = \dfrac{50{,}000}{10{,}000} = 5$ ha

Why the other options are wrong:

- A halves the area.
- C is off by a factor of ten in the hectare conversion.
- D is off by a factor of ten the other way.

Final Answer: $A = 5$ ha $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q30

Q31.

Solution

Concept – wavelength from frequency: $\lambda = \dfrac{c}{f}$, with $c = 3 \times 10^8$ m/s.

Step 1 – write the frequency: $f = 3 \times 10^{14}$ Hz

Step 2 – divide the speed of light by the frequency: $\lambda = \dfrac{3 \times 10^8}{3 \times 10^{14}}$

Step 3 – divide the coefficients and subtract the exponents: $\lambda = 1 \times 10^{8-14} = 10^{-6}$ m

Step 4 – convert to micrometres: 10^{-6} m $= 1$ μm

Step 5 – locate it: 1 μm sits in the near-infrared, just beyond the visible band.

Why the other options are wrong:

- A, B and D come from exponent-handling slips.

Final Answer: $\lambda = 1$ μm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q31

Q32.

Solution

Concept – active versus passive sensors: An active sensor supplies its own energy, illuminates the target and measures the return; a passive sensor only records energy from an external source such as the Sun or the Earth's emission.

Step 1 – test each option: A camera records reflected sunlight – passive.

Step 2 – continue: A synthetic aperture radar transmits its own microwave pulses and records the backscatter – active.

Step 3 – finish: An optical scanner and a thermal radiometer both record natural radiation – passive.

Step 4 – select: Only the SAR is active.

Final Answer: synthetic aperture radar (SAR) $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q32

Q33.

Solution

Concept – ground sampling distance of a pushbroom sensor: $\text{GSD} = \dfrac{\text{swath width}}{\text{number of detectors across the line}}$.

Step 1 – convert the swath to metres: $15 \text{ km} = 15{,}000 \text{ m}$

Step 2 – write the number of detectors: $N = 15{,}000$

Step 3 – divide: $\text{GSD} = \dfrac{15{,}000}{15{,}000}$

Step 4 – evaluate: $\text{GSD} = 1 \text{ m}$

Why the other options are wrong:

- B and C are off by factors of ten.
- D quotes the swath in kilometres as if it were the pixel size.

Final Answer: GSD $= 1$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q33

Q34.

Solution

Concept – why radar and LiDAR are active: An active sensor carries its own illumination source and measures the reflected or backscattered part of the energy it transmitted.

Step 1 – radar: Radar transmits microwave pulses and times/measures the backscattered echo.

Step 2 – LiDAR: LiDAR fires laser pulses and records the reflected return.

Step 3 – consequence: Because they supply their own energy, both can operate day or night and (radar) through cloud.

Why the other options are wrong:

- A describes passive optical sensing.
- C describes a passive thermal sensor.
- D is false – radar works in the microwave band, LiDAR in the optical/near-IR, and neither is limited to the visible.

Final Answer: they transmit their own energy and record the return $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept – the four resolutions of a remote-sensing system: Spectral, spatial, radiometric and temporal resolution each describe a different capability.

Step 1 – recall temporal resolution: Temporal resolution is the revisit interval – how often the sensor can re-image the same ground area.

Step 2 – match the description: "Number of days to revisit and re-image the same area" is exactly the revisit period.

Why the other options are wrong:

- A (spectral) concerns the width and number of wavelength bands.
- B (spatial) concerns the ground size of a pixel.
- C (radiometric) concerns the number of grey levels recorded.

Final Answer: temporal resolution $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q35

Q36.

Solution

Concept – radiometric resolution: A sensor with n bits per pixel can record 2^n discrete grey levels.

Step 1 – write the bit depth: $n = 10$

Step 2 – raise 2 **to that power:** 2^{10}

Step 3 – evaluate: $2^{10} = 1024$

Why the other options are wrong:

- B ($256 = 2^8$) is for 8-bit data.
- C ($512 = 2^9$) is for 9-bit data.
- D (100) is not a power of two.

Final Answer: 1024 grey levels $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q36

Q37.

Solution

Concept – map-algebra operation types: Map algebra classifies functions as local (per cell), focal (per neighbourhood), zonal (per zone) and global (whole layer).

Step 1 – describe the operation: Each output cell is formed only from the two input cells at the *same* location, $4 + 3 = 7$.

Step 2 – match the class: Using just the coincident cells, independent of any neighbours or zones, is a local operation.

Why the other options are wrong:

- B (focal) would use surrounding cells.

- C (zonal) would summarise cells grouped by a zone layer.
- D (global) would use the entire raster (e.g. distance functions).

Final Answer: a local (cell-by-cell) map-algebra operation $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q37

Q38.

Solution

Concept – uncompressed raster storage: size = rows × columns × bytes per cell.

Step 1 – multiply the grid dimensions: $2048 \times 2048 = 4{,}194{,}304$ cells

Step 2 – multiply by the bytes per cell: $4{,}194{,}304 \times 1 = 4{,}194{,}304$ bytes

Step 3 – convert to megabytes (1 MB = 1,048,576 bytes): $\dfrac{4{,}194{,}304}{1{,}048{,}576} = 4$

Step 4 – state the size: ≈ 4 MB

Why the other options are wrong:

- A and B under-count the number of cells.
- C (16 MB) would apply if each cell used 4 bytes.

Final Answer: ≈ 4 MB $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q38

Q39.

Solution

Concept – focal (neighbourhood) function: A focal function assigns to each output cell a value computed from that cell and the cells around it within a defined window (e.g. a 3×3 kernel).

Step 1 – identify the input set: The moving window centred on each cell supplies the neighbours used in the calculation.

Step 2 – give an example: A smoothing (mean) filter or a slope computation reads the centre cell plus its eight neighbours.

Why the other options are wrong:

- A describes a local function.
- B describes a global function.
- C describes a zonal function.

Final Answer: the cell together with its surrounding neighbours in a window $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q39

Q40.

Solution

Concept – reclassification: Reclassification replaces the value of each cell with a new value according to a rule or class table; it is a local operation.

Step 1 – describe the task: Continuous slope values are grouped into three ordinal classes $(1, 2, 3)$.

Step 2 – match the operation: Mapping ranges of input values to new class codes, cell by cell, is reclassification.

Why the other options are wrong:

- A (buffer) creates zones around features by distance.
- C (network analysis) works on connected line networks.
- D (interpolation) estimates values at unsampled locations.

Final Answer: a reclassification (local) operation $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q40

Q41.

Solution

Concept – map algebra / band arithmetic: Combining two raster bands with an arithmetic expression, cell by cell, is a map-algebra (band-arithmetic) operation.

Step 1 – read the expression: $\text{NDVI} = \dfrac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$ uses the coincident NIR and Red cell values.

Step 2 – classify it: Subtraction, addition and division applied per cell to two bands is raster band arithmetic (a local map-algebra operation).

Why the other options are wrong:

- A (vector overlay) applies to polygon layers, not raster bands.
- B (network routing) is for line networks.
- D (geocoding) converts addresses to coordinates.

Final Answer: map algebra (band arithmetic) on rasters $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q41

Q42.

Solution

Concept – number of satellites for a GNSS fix: A GNSS position solution has four unknowns: the three coordinates X, Y, Z and the receiver clock error δt.

Step 1 – count the unknowns: $X,\ Y,\ Z,\ \delta t$ – four unknowns.

Step 2 – relate to observations: Each tracked satellite gives one pseudorange equation.

Step 3 – apply the requirement: Solving four unknowns needs at least four independent equations, hence four satellites.

Why the other options are wrong:

- A (3) ignores the clock-error unknown.
- B (5) and C (6) exceed the minimum (they improve geometry/DOP but are not the minimum).

Final Answer: 4 satellites $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q42

Q43.

Solution

Concept – pseudorange from travel time: $\rho = c \times t$, with c the speed of light.

Step 1 – write the values: $c = 3 \times 10^8$ m/s, $t = 0.06$ s

Step 2 – multiply: $\rho = 3 \times 10^8 \times 0.06$

Step 3 – evaluate the coefficient: $3 \times 0.06 = 0.18$

$\rho = 0.18 \times 10^8$ m

Step 4 – normalise: $\rho = 1.8 \times 10^7$ m

Step 5 – convert to kilometres: $\rho = 1.8 \times 10^4$ km $= 18{,}000$ km

Why the other options are wrong:

- B, C and D come from power-of-ten or unit slips.

Final Answer: $\rho \approx 18{,}000$ km $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q43

Q44.

Solution

Concept – UTM zone number from longitude: zone $= \left\lfloor \dfrac{\lambda + 180^\circ}{6^\circ} \right\rfloor + 1$, with east longitudes positive.

Step 1 – add 180° to the longitude: $78^\circ + 180^\circ = 258^\circ$

Step 2 – divide by the zone width: $\dfrac{258^\circ}{6^\circ} = 43$

Step 3 – take the floor: $\lfloor 43 \rfloor = 43$

Step 4 – add one: $43 + 1 = 44$

Step 5 – check: Zone 44 spans 78°–84°E, and 78°E lies on its western edge, consistent with the count.

Why the other options are wrong:

- B forgets the "$+1$".
- C and D shift the zone by one either way.

Final Answer: UTM zone $44 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q44

Q45.

Solution

Concept – four-parameter (Helmert similarity) transformation: A conformal 2D transformation preserves shape (angles) and therefore allows only a shift, a rotation and a single uniform scale.

Step 1 – count the parameters: Two translations (t_x, t_y), one rotation (θ) and one scale (s) – four in all.

Step 2 – note the conformal condition: Using the *same* scale in both axes keeps angles unchanged, which is what "conformal" requires.

Why the other options are wrong:

- A and B are too restrictive (single parameter families).
- D is the affine (six-parameter) transformation, which allows different scales and shear and is *not* conformal.

Final Answer: two translations, one rotation and one uniform scale $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q45

Q46.

Solution

Concept – properties of the (Transverse) Mercator projection: The Mercator family, including the Transverse Mercator used by UTM, is conformal: it preserves local angles and the shapes of small features.

Step 1 – state the defining property: At every point the scale is the same in all directions, so meridians and parallels cross at right angles and small shapes are kept true.

Step 2 – give the consequence: This makes the projection ideal for large-scale mapping and navigation, where correct local angles matter.

Why the other options are wrong:

- B: a conformal projection cannot also be equal-area; Mercator badly exaggerates high-latitude areas.
- C: no single map is equidistant along every line.
- D: Mercator is cylindrical, not azimuthal.

Final Answer: conformal – preserves local angles and shapes $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q46

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	D	2	B	3	C	4	D	5	B
6	C	7	A	8	C	9	B	10	B
11	C	12	A	13	D	14	D	15	B
16	C	17	C	18	B	19	B	20	D
21	C	22	A	23	D	24	B	25	A
26	A	27	D	28	C	29	A	30	B
31	C	32	B	33	A	34	B	35	D
36	A	37	A	38	D	39	D	40	B
41	C	42	D	43	A	44	A	45	C
46	A								