GATE Geomatics Engineering

Sample Paper – 8

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 $\alpha = 11.7 \times 10^{-6}$ °C^{-1}.

Principles of Surveying and Error Theory

Q1. A single observation of a quantity has a standard deviation of ± 6 mm. Taking the probable error as 0.6745 times the standard deviation, the probable error of the observation is nearest to: **[1 mark]**

(A) ± 6 mm

(B) ± 9 mm

(C) ± 4 mm

(D) ± 2 mm

Q2. A horizontal angle is measured twice: $45°30'20''$ with weight 3 and $45°30'28''$ with weight 1. The weighted mean of the angle is: **[1 mark]**

(A) $45°30'20''$

(B) $45°30'28''$

(C) $45°30'24''$

(D) $45°30'22''$

Q3. Ten equally reliable observations of a length are taken, each with a standard error of ± 5 mm. The standard error of the arithmetic mean, $\sigma_m = \sigma/\sqrt{n}$, is nearest to: **[1 mark]**

(A) ± 5 mm

(B) ± 0.5 mm

(C) ± 50 mm

(D) ± 1.6 mm

Q4. The principle of least squares states that the most probable values of the observed quantities are those for which the sum of: **[1 mark]**

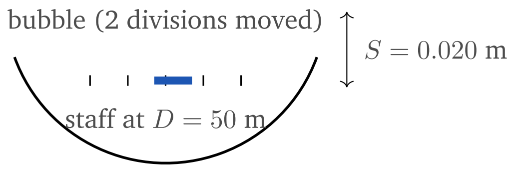
(A) the residuals themselves is a minimum

(B) the weighted squares of the residuals is a minimum

(C) the absolute values of the residuals is a maximum

(D) the cubes of the residuals is zero

Q5. A bubble tube is tested by the peg method: when the bubble is moved 2 divisions the staff reading on a scale 50 m away changes by 0.020 m (see sketch). Its sensitiveness, $\alpha'' = \dfrac{S}{nD} \times 206265$, is nearest to: **[1 mark]**



(A) $41''$

(B) $21''$

(C) $82''$

(D) $206''$

Q6. The two-peg (reciprocal) test carried out on a dumpy level is used mainly to detect and quantify: **[1 mark]**

(A) the collimation error, i.e. the line of sight not being truly horizontal when the bubble is centred

(B) the combined effect of earth curvature only

(C) parallax between the image and the cross-hairs

(D) errors in the graduation of the levelling staff

Distance Measurement, Levelling and Contouring

Q7. A 30 m steel tape standardized under a pull of 100 N is used in the field under a pull of 160 N. The tape cross-section is 3 mm^2 and $E = 2 \times 10^5$ N/mm^2. The pull (tension) correction per tape length, $C_p = \dfrac{(P - P_0)L}{AE}$, is: **[1 mark]**

(A) $+1.5$ mm

(B) $+3.0$ mm

(C) $+6.0$ mm

(D) $+0.3$ mm

Q8. A 30 m tape of total weight 15 N hangs freely between supports under a pull of 100 N. The sag correction, $C_s = \dfrac{W^2 L}{24P^2}$, to be applied to the measured length is nearest to: **[1 mark]**

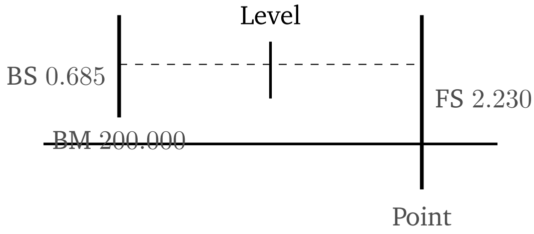
(A) -14 mm

(B) -56 mm

(C) -28 mm

(D) -7 mm

Q9. In the differential-levelling set-up shown, a backsight of 0.685 m is taken on a benchmark of RL 200.000 m and a foresight of 2.230 m is taken on the next point. The reduced level of the forepoint is: **[1 mark]**



(A) 202.915 m

(B) 198.455 m

(C) 201.545 m

(D) 197.770 m

Q10. A distant point is sighted over a horizontal distance of 2 km. The combined correction for earth curvature and refraction, $C = -0.0673\,D^2$ (with D in km, C in m), is nearest to: **[1 mark]**

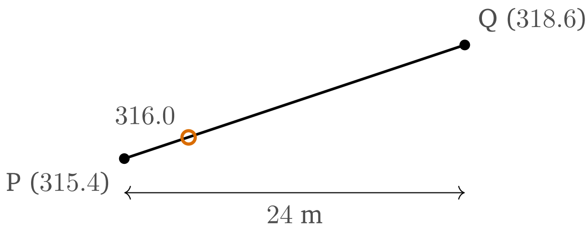
(A) -0.135 m

(B) -0.673 m

(C) -0.067 m

(D) -0.27 m

Q11. Points P and Q lie 24 m apart on a uniform slope. P has RL 315.4 m and Q has RL 318.6 m, as shown. By linear interpolation the horizontal distance from P to the point where the 316.0 m contour crosses PQ is: **[1 mark]**



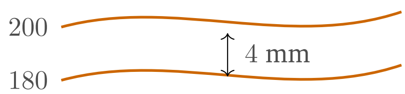
(A) 4.5 m

(B) 12 m

(C) 6 m

(D) 9 m

Q12. On a map of scale 1:25,000 with a contour interval of 20 m, two adjacent contours are 4 mm apart on the paper (see contour sketch). The ground slope between them is: **[1 mark]**



(A) 1 in 100

(B) 1 in 25

(C) 1 in 20

(D) 1 in 5

Theodolite, Traverse and Triangulation

Q13. The fore bearing (whole-circle bearing) of a line CD is $205°15'$. The back bearing of the line is: **[1 mark]**

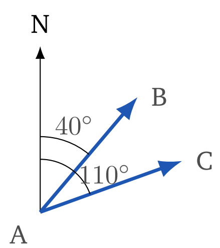
(A) $205°15'$

(B) $25°15'$

(C) $385°15'$

(D) $155°15'$

Q14. From station A two lines are observed: AB with whole-circle bearing $40°$ and AC with whole-circle bearing $110°$, as shown. The included angle $\angle BAC$ is: **[1 mark]**



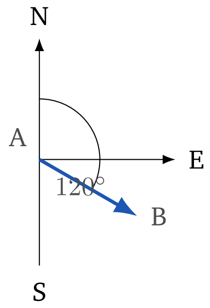
(A) $150°$

(B) $70°$

(C) $75°$

(D) $40°$

Q15. A traverse line of length 150 m has a whole-circle bearing of $120°$, as shown. Its latitude ($L\cos\theta$) and departure ($L\sin\theta$) are respectively: **[1 mark]**



(A) 75.0 m S, 129.9 m E

(B) 129.9 m S, 75.0 m E

(C) 75.0 m N, 129.9 m E

(D) 129.9 m N, 75.0 m E

Q16. A closed traverse has a total perimeter of 500 m and a departure misclosure of -0.25 m. By Bowditch's rule the correction to the departure of a side 120 m long is: **[1 mark]**

(A) $+0.06$ m

(B) $+0.25$ m

(C) $+0.30$ m

(D) $+0.012$ m

Q17. A closed traverse of perimeter 1000 m has a linear closing error of 0.5 m. Its relative (fractional) error of closure is: **[1 mark]**

(A) 1 in 1000

(B) 1 in 2000

(C) 1 in 500

(D) 1 in 4000

Q18. When the angular measurements of a traverse are more precise than the linear measurements, the traverse is balanced by the transit rule, in which the correction to the latitude of a side is proportional to: **[1 mark]**

(A) the length of that side

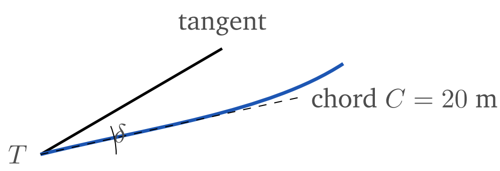
(B) the square of the length of that side

(C) the latitude of that side

(D) the total perimeter of the traverse

Curves, Tacheometry and Field Astronomy

Q19. On a simple circular curve of radius $R = 250$ m set out by Rankine's method of deflection angles, the deflection angle for a chord of 20 m, $\delta = 1718.87\,\dfrac{C}{R}$ minutes, is nearest to: **[1 mark]**



(A) $1°08.8'$

(B) $4°35'$

(C) $0°34.4'$

(D) $2°17.5'$

Q20. A simple circular curve of radius 350 m has a deflection (intersection) angle of $48°$ between its tangents. The length of the curve, $L = \dfrac{\pi R \Delta}{180°}$, is nearest to: **[1 mark]**

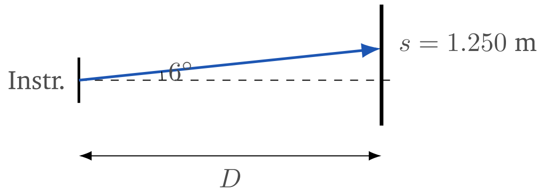
(A) 293.2 m

(B) 146.6 m

(C) 168.0 m

(D) 586.4 m

Q21. A tacheometer with multiplying constant $k = 100$ and additive constant $C = 0$ reads a staff intercept of 1.250 m with the line of sight inclined at $6°$ to the horizontal (staff held vertical), as shown. The horizontal distance, $D = k\,s\cos^2\theta$, is nearest to: **[2 marks]**



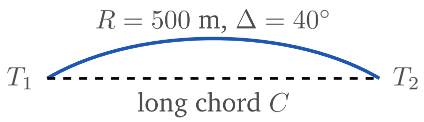
(A) 125.0 m

(B) 130.2 m

(C) 123.6 m

(D) 118.4 m

Q22. A simple circular curve of radius 500 m has a deflection angle of $40°$, as shown. Its long chord, $C = 2R\sin(\Delta/2)$, is nearest to: **[2 marks]**



(A) 171 m

(B) 302 m

(C) 500 m

(D) 342 m

Q23. An external-focusing tacheometer has a multiplying constant $k = 100$ and an additive constant $C = 0.30$ m. With the line of sight horizontal it reads a staff intercept of 0.845 m. The horizontal distance, $D = k\,s + C$, is: **[2 marks]**

(A) 84.5 m

(B) 85.1 m

(C) 84.8 m

(D) 88.0 m

Q24. In field astronomy the altitude of a star is measured as 55° above the horizon. Its zenith distance (90° – altitude) is: **[2 marks]**

(A) 145°

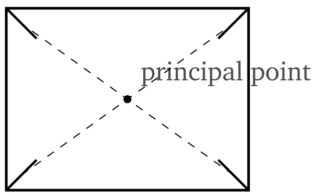
(B) 55°

(C) 90°

(D) 35°

Photogrammetry

Q25. The interior orientation of an aerial photograph, carried out with the fiducial marks shown, re-establishes: **[2 marks]**



fiducial marks

(A) the exposure station's position in the ground coordinate system

(B) the tilt angles ω and φ of the camera axis

(C) the principal point and the calibrated focal length relative to the fiducial marks

(D) the ground control coordinates of the photographed terrain

Q26. A vertical photograph is taken with a camera of focal length 150 mm from a flying height of 3000 m above mean sea level, over ground whose mean elevation is 600 m. The photograph scale, $\dfrac{f}{H-h}$, is: **[2 marks]**

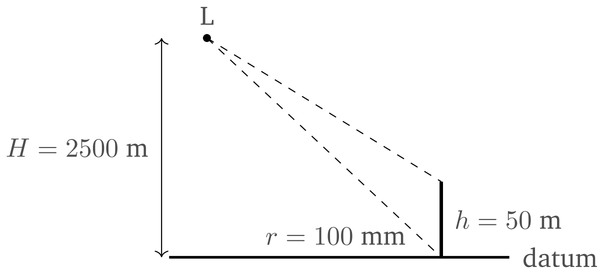
(A) 1:20,000

(B) 1:16,000

(C) 1:12,000

(D) 1:8000

Q27. On a vertical photograph the relief displacement of a vertical object is $d = \dfrac{r\,h}{H}$. For radial distance $r = 100$ mm, object height $h = 50$ m and flying height $H = 2500$ m (see figure), the relief displacement is: **[2 marks]**



(A) 2.0 mm

(B) 4.0 mm

(C) 1.0 mm

(D) 5.0 mm

Q28. Vertical photographs of format 230 mm $\times$ 230 mm are taken at a scale of 1:10,000 with a forward (end) overlap of 60%. The air base (ground distance between successive exposure stations) is: **[2 marks]**

(A) 1380 m

(B) 920 m

(C) 2300 m

(D) 460 m

Q29. On a stereo pair flown at $H = 1500$ m the absolute stereoscopic parallax at the base of a tower is 75 mm and the parallax difference between the top and the base of the tower is 1.5 mm. The height of the tower, $h = \dfrac{H\,\Delta p}{P}$, is: **[2 marks]**

(A) 15 m

(B) 45 m

(C) 30 m

(D) 22.5 m

Q30. A straight canal images as a line 60 mm long on a vertical photograph of scale 1:12,000. Its true length on the ground is: **[2 marks]**

(A) 720 m

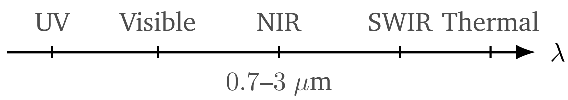
(B) 500 m

(C) 360 m

(D) 1440 m

Remote Sensing

Q31. Electromagnetic radiation of frequency 1.5×10^{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) 0.5 μm

(B) 2 μm

(C) 5 μm

(D) 20 μm

Q32. In digital image classification, which of the following is an unsupervised technique that groups pixels purely on their spectral similarity without prior training data? **[2 marks]**

(A) maximum-likelihood classification

(B) minimum-distance-to-means classification

(C) parallelepiped classification

(D) K-means / ISODATA clustering

Q33. Unsupervised classification of a multispectral image differs from supervised classification chiefly in that it: [2 marks]

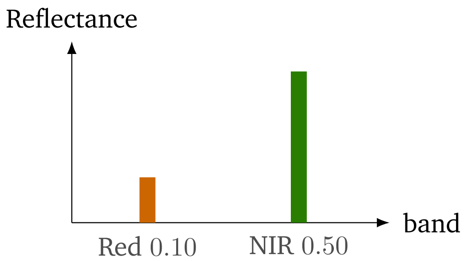
(A) groups pixels into natural spectral clusters without prior training areas, and the analyst assigns class labels afterwards

(B) requires the analyst to delineate representative training areas before classification

(C) always produces a higher classification accuracy than any supervised method

(D) uses field-verified ground truth for every individual pixel in the scene

Q34. For a healthy vegetation pixel the near-infrared reflectance is 0.50 and the red reflectance is 0.10. The Normalized Difference Vegetation Index, $\text{NDVI} = \dfrac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$, is nearest to: [2 marks]



(A) 0.20

(B) 0.40

(C) 0.60

(D) 0.67

Q35. In K-means unsupervised classification of a satellite image, the number of output clusters (classes) is: [2 marks]

(A) determined entirely automatically with no input from the analyst

(B) specified in advance by the analyst before the iterations begin

(C) always equal to the number of spectral bands in the image

(D) always fixed at two

Q36. An optical sensor has an instantaneous field of view (IFOV) of 1.5 mrad and operates from an altitude of 800 km. The nadir ground resolution cell (IFOV $\times$ altitude) is nearest to: **[2 marks]**

(A) 800 m

(B) 1200 m

(C) 533 m

(D) 2400 m

Geographic Information Systems

Q37. The Moran's I statistic computed for the attribute values on the grid below comes out close to $+1$. This indicates: **[2 marks]**

8	8	1	1
8	7	2	1
7	8	1	2
8	7	2	1

(A) complete spatial randomness with no discernible pattern

(B) negative spatial autocorrelation, with high and low values alternating

(C) that the attribute is uniform everywhere on the grid

(D) strong positive spatial autocorrelation, with similar values clustered together

Q38. The statement "everything is related to everything else, but near things are more related than distant things" is the conceptual basis of spatial autocorrelation. It is known as: **[2 marks]**

(A) the map-overlay principle

(B) the modifiable areal unit problem

(C) Tobler's first law of geography

(D) the minimum-mapping-unit rule

Q39. A single-band raster layer has 2000 rows and 1500 columns, each cell stored as one byte. The uncompressed storage size of the layer is nearest to: **[2 marks]**

(A) 1 MB

(B) 12 MB

(C) 3 MB

(D) 300 KB

Q40. Which of the following is a genuine advantage of the vector data model over the raster model in a GIS? **[2 marks]**

(A) it stores discrete features with precise boundaries and explicit topology, using little storage for such features

(B) it is always faster for overlay analysis of continuous surfaces

(C) every location is described by a single cell value on a fixed grid

(D) it is inherently unable to represent linear features

Q41. In inverse-distance-weighted (IDW) spatial interpolation of a continuous surface from sample points, the weight given to each sample point is such that: **[2 marks]**

(A) nearer sample points are given greater weight than more distant ones

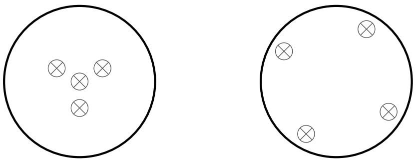
(B) all sample points are weighted equally regardless of distance

(C) only the single farthest point controls the estimate

(D) the weight increases as the distance to the point increases

GNSS, Cartography and Map Projections

Q42. For a GNSS fix the geometric dilution of precision (GDOP) is best (smallest) when the tracked satellites are (see sky plots): **[2 marks]**



poor (clustered) good (spread out)

(A) clustered close together near the zenith

(B) all bunched near the horizon in one direction

(C) well distributed across the sky, forming a large tetrahedron volume

(D) exactly two satellites overhead

Q43. The Bursa–Wolf (seven-parameter Helmert) similarity transformation used for a datum shift between two three-dimensional Cartesian systems consists of: **[2 marks]**

(A) three translations, three rotations and one scale factor

(B) three translations only

(C) two translations and two rotations

(D) three translations, three rotations and three scale factors

Q44. A GNSS signal takes 0.065 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) 195 km

(B) 1950 km

(C) 2100 km

(D) $19{,}500$ km

Q45. In the Bursa–Wolf datum transformation, the single scale-factor parameter (usually quoted in parts per million) accounts for: **[2 marks]**

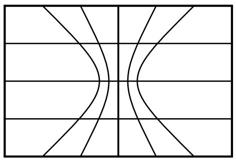
(A) a rotation of the coordinate frame about the Z axis

(B) a small uniform difference in scale between the two coordinate systems

(C) the translation of the coordinate origin between the two datums

(D) the flattening of the reference ellipsoid

Q46. The Universal Transverse Mercator (UTM) grid used on Indian topographic sheets is based on the Transverse Mercator projection (graticule shown). This projection is: **[2 marks]**



central meridian true to scale

(A) an equal-area cylindrical projection

(B) an azimuthal equidistant projection

(C) a conformal (transverse cylindrical) projection

(D) a gnomonic projection

Detailed Solutions

Q1.

Solution

Concept – probable error: The probable error of a single observation is a fixed fraction of its standard deviation, $\text{PE} = 0.6745\,\sigma$.

Step 1 – write the given standard deviation: $\sigma = 6$ mm

Step 2 – substitute into the probable-error relation: $\text{PE} = 0.6745 \times 6$

Step 3 – multiply: $\text{PE} = 4.047$ mm

Step 4 – round to the nearest option: $\text{PE} \approx \pm 4$ mm

Why the other options are wrong:

- A: ± 6 mm is the standard deviation itself, not the probable error.
- B: ± 9 mm would need a factor of 1.5, not 0.6745.
- D: ± 2 mm halves the standard deviation, which is not the definition.

Final Answer: $\text{PE} \approx \pm 4$ mm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q1

Q2.

Solution

Concept – weighted mean: With weights w_i the weighted mean is $\bar{x} = \dfrac{\sum w_i x_i}{\sum w_i}$. Work with the seconds above the common $45°30'$.

Step 1 – list the seconds and weights: $x_1 = 20''$ $(w_1 = 3)$ and $x_2 = 28''$ $(w_2 = 1)$.

Step 2 – form each product $w_i x_i$: $w_1 x_1 = 3 \times 20 = 60$

$w_2 x_2 = 1 \times 28 = 28$

Step 3 – add the products: $60 + 28 = 88$

Step 4 – add the weights: $3 + 1 = 4$

Step 5 – divide: $\bar{x} = \dfrac{88}{4} = 22''$

Step 6 – add back the common part: $45°30'22''$

Final Answer: $45°30'22'' \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q2

Q3.

Solution

Concept – standard error of the mean: The mean of n equally reliable observations is $\sqrt{n}$ times more precise than a single one: $\sigma_m = \dfrac{\sigma}{\sqrt{n}}$.

Step 1 – write the given values: $\sigma = 5$ mm and $n = 10$.

Step 2 – find $\sqrt{n}$: $\sqrt{10} = 3.162$

Step 3 – divide: $\sigma_m = \dfrac{5}{3.162}$

Step 4 – evaluate: $\sigma_m = 1.58$ mm

Step 5 – round: $\sigma_m \approx \pm 1.6$ mm

Why the other options are wrong:

- A: ± 5 mm ignores the averaging effect of n observations.
- B: ± 0.5 mm divides by n instead of $\sqrt{n}$.
- C: ± 50 mm multiplies instead of divides.

Final Answer: $\sigma_m \approx \pm 1.6$ mm $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q3

Q4.

Solution

Concept – principle of least squares: The most probable values are those that minimise the sum of the weighted squares of the residuals.

Step 1 – write the criterion: Minimise $\sum w_i v_i^2$, where v_i is the residual and w_i its weight.

Step 2 – reason why squares are used: Squaring makes every residual contribute a positive amount, so positive and negative residuals cannot cancel, and larger residuals are penalised more heavily.

Step 3 – role of the weights: More precise observations (higher weight) are made to fit more closely.

Why the other options are wrong:

- A: a plain sum of residuals can be zero yet the fit be poor.
- C: maximising residuals is the opposite of a best fit.
- D: cubes do not give a stable, always-positive measure.

Final Answer: sum of the weighted squares of the residuals is a minimum $\Rightarrow \boxed{\text{B}}$

$\boxed{\text{Answer: (B)}}$ Go Back to Q4

Q5.

Solution

Concept – sensitiveness of a bubble tube: The sensitiveness is the angle (in seconds) turned per bubble division, found from the change in staff reading over a known distance: $\alpha'' = \dfrac{S}{n\,D} \times 206265$.

Step 1 – list the data: $S = 0.020$ m (change in staff reading), $n = 2$ divisions, $D = 50$ m.

Step 2 – form the ratio $\dfrac{S}{nD}$**:** $\dfrac{0.020}{2 \times 50} = \dfrac{0.020}{100}$

Step 3 – evaluate the ratio: $\dfrac{0.020}{100} = 0.0002$ radian per division

Step 4 – convert radians to seconds of arc: $\alpha'' = 0.0002 \times 206265$

Step 5 – multiply: $\alpha'' = 41.25''$

Step 6 – round: $\alpha'' \approx 41''$ per division.

Final Answer: $\alpha'' \approx 41'' \Rightarrow \boxed{\text{A}}$

$\boxed{\text{Answer: (A)}}$ Go Back to Q5

Q6.

Solution

Concept – purpose of the two-peg test: The two-peg (reciprocal levelling) test checks whether the line of collimation is parallel to the axis of the bubble tube.

Step 1 – recall the set-up: A level is placed midway between two pegs and then close to one peg; readings are compared.

Step 2 – interpret the result: Any difference reveals that the line of sight is not horizontal when the bubble is centred, i.e. a collimation (or line-of-sight) error.

Step 3 – note why the mid-point reading is unaffected: Curvature and collimation errors are equal on both staves from the mid-point, so they cancel there and the test isolates the instrument's collimation error.

Why the other options are wrong:

- B: earth curvature alone is a field-geometry effect, not what this instrument test targets.
- C: parallax is removed by focusing, not by the two-peg test.
- D: staff graduation errors are checked by staff calibration, not this test.

Final Answer: the collimation error of the level $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q6

Q7.

Solution

Concept – pull (tension) correction: When the field pull differs from the standard pull, the tape stretches elastically: $C_p = \dfrac{(P - P_0)\,L}{A\,E}$, additive when $P > P_0$.

Step 1 – find the excess pull: $P - P_0 = 160 - 100 = 60$ N

Step 2 – form the denominator $A\,E$: $A\,E = 3 \times 2 \times 10^5 = 6 \times 10^5$ N

Step 3 – multiply the excess pull by the length: $(P - P_0)\,L = 60 \times 30 = 1800$ N·m

Step 4 – divide: $C_p = \dfrac{1800}{6 \times 10^5} = 0.003$ m

Step 5 – convert to millimetres and fix the sign: $C_p = +3.0$ mm (the tape is pulled tighter, so it is longer, and the correction is added).

Final Answer: $C_p = +3.0$ mm $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q7

Q8.

Solution

Concept – sag correction: A tape suspended between supports hangs in a catenary and reads too long; the correction is subtractive: $C_s = \dfrac{W^2 L}{24P^2}$.

Step 1 – square the tape weight: $W^2 = 15^2 = 225$

Step 2 – multiply by the length: $W^2 L = 225 \times 30 = 6750$

Step 3 – form the denominator: $24P^2 = 24 \times 100^2 = 24 \times 10000 = 240000$

Step 4 – divide: $C_s = \dfrac{6750}{240000} = 0.02813$ m

Step 5 – convert to millimetres and apply the sign: $C_s = 28.1$ mm, subtractive, so -28 mm.

Final Answer: $C_s \approx -28$ mm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q8

Q9.

Solution

Concept – reduced level by the rise-and-fall / HI method: RL of forepoint = RL of BM + BS − FS.

Step 1 – add the backsight to the benchmark RL (gives the collimation line): $200.000 + 0.685 = 200.685$ m

Step 2 – subtract the foresight: $200.685 - 2.230 = 198.455$ m

Step 3 – check the sense: The foresight (2.230) exceeds the backsight (0.685), so the ground has fallen; $198.455 < 200.000$, which is consistent.

Final Answer: RL $= 198.455$ m $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept – combined curvature and refraction correction: Over a long horizontal sight the earth's curvature lowers the apparent level and refraction partly offsets it; the net correction is $C = -0.0673\, D^2$ with D in kilometres.

Step 1 – write the sight distance: $D = 2$ km

Step 2 – square the distance: $D^2 = 2^2 = 4$

Step 3 – multiply by the coefficient: $C = -0.0673 \times 4$

Step 4 – evaluate: $C = -0.2692$ m

Step 5 – round: $C \approx -0.27$ m

Why the other options are wrong:

- A: -0.135 m uses D instead of D^2.
- B: -0.673 m drops the factor of $D^2 = 4$ incorrectly.
- C: -0.067 m ignores the squaring altogether.

Final Answer: $C \approx -0.27$ m $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q10

Q11.

Solution

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

Step 1 – total rise from P to Q: $318.6 - 315.4 = 3.2$ m

Step 2 – rise from P up to the contour: $316.0 - 315.4 = 0.6$ m

Step 3 – form the fraction of the total distance: $\frac{0.6}{3.2} = 0.1875$

Step 4 – multiply by the horizontal distance PQ: $d = 0.1875 \times 24$

Step 5 – evaluate: $d = 4.5$ m

Final Answer: $d = 4.5$ m from P $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q11

Q12.

Solution

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

Step 1 – convert the map spacing to a ground distance using the scale: $4\text{ mm} \times 25{,}000 = 100{,}000$ mm

Step 2 – convert to metres: $100{,}000\text{ mm} = 100$ m

Step 3 – form the slope ratio: slope $= \frac{20\text{ m}}{100\text{ m}}$

Step 4 – reduce to 1 in n: $\frac{20}{100} = \frac{1}{5}$

Final Answer: slope $= 1$ in $5 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q12

Q13.

Solution

Concept – back bearing from fore bearing: Back bearing $=$ fore bearing $\pm 180°$ (subtract $180°$ when the fore bearing exceeds $180°$).

Step 1 – note the fore bearing: FB $= 205°15'$

Step 2 – since it is greater than $180°$, subtract $180°$: BB $= 205°15' - 180°$

Step 3 – evaluate: BB $= 25°15'$

Final Answer: BB $= 25°15' \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q13

Q14.

Solution

Concept – included angle from two whole-circle bearings at a station: The included angle between two lines from a common station is the difference of their whole-circle bearings.

Step 1 – write the two bearings: WCB of AB $= 40°$, WCB of AC $= 110°$.

Step 2 – take the difference: $\angle BAC = 110° - 40°$

Step 3 – evaluate: $\angle BAC = 70°$

Why the other options are wrong:

- A: $150°$ adds the bearings instead of subtracting.
- C: $75°$ has no basis in the data.
- D: $40°$ is the bearing of AB alone, not the included angle.

Final Answer: $\angle BAC = 70° \Rightarrow \boxed{\text{B}}$

Answer: (B) 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 whole-circle bearing.

Step 1 – note the quadrant: $\theta = 120°$ lies in the second (S–E) quadrant, so the latitude is southerly and the departure easterly.

Step 2 – compute the latitude: Lat $= 150\cos 120°$

$\cos 120° = -0.5$

Lat $= 150 \times (-0.5) = -75.0$ m, i.e. 75.0 m S.

Step 3 – compute the departure: Dep $= 150\sin 120°$

$\sin 120° = 0.8660$

Dep $= 150 \times 0.8660 = 129.9$ m E.

Final Answer: 75.0 m S, 129.9 m E $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q15

Q16.

Solution

Concept – Bowditch's rule for balancing a traverse: The correction to the departure (or latitude) of a side is proportional to the length of that side: correction $= -(\text{total misclosure}) \times \dfrac{\text{length of side}}{\text{perimeter}}$.

Step 1 – write the data: Departure misclosure $= -0.25$ m, side length $= 120$ m, perimeter $= 500$ m.

Step 2 – form the length ratio: $\dfrac{120}{500} = 0.24$

Step 3 – multiply by the misclosure: $0.24 \times (-0.25) = -0.06$ m

Step 4 – reverse the sign to correct (balance) the traverse: correction $= +0.06$ m

Final Answer: correction $= +0.06$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q16

Q17.

Solution

Concept – relative (fractional) error of closure: $\text{relative error} = \dfrac{\text{linear closing error}}{\text{perimeter}}$, expressed as 1 in n.

Step 1 – write the values: Closing error $= 0.5$ m, perimeter $= 1000$ m.

Step 2 – form the ratio: $\dfrac{0.5}{1000}$

Step 3 – reduce to 1 in n: $\dfrac{0.5}{1000} = \dfrac{1}{2000}$

Final Answer: 1 in $2000 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q17

Q18.

Solution

Concept – transit rule for balancing a traverse: The transit rule is used when the angular work is more precise than the linear work; the correction to a side's latitude is proportional to that side's own latitude (and to its departure for the departure correction).

Step 1 – recall the transit-rule proportion: correction to latitude of a side $= -(\Sigma L) \times \dfrac{\text{latitude of side}}{\Sigma|\text{latitudes}|}$.

Step 2 – identify the proportional quantity: The correction depends on the latitude of that side, not on its length.

Why the other options are wrong:

- A: proportionality to length is Bowditch's rule, not the transit rule.
- B: no rule uses the square of the length.
- D: the perimeter appears in the denominator of Bowditch, not as the driving quantity here.

Final Answer: the latitude of that side $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q18

Q19.

Solution

Concept – Rankine's deflection angle for a chord: For a circular curve the tangential (deflection) angle to a chord C is $\delta = 1718.87\,\dfrac{C}{R}$ minutes.

Step 1 – write the data: $C = 20$ m, $R = 250$ m.

Step 2 – form the ratio $\frac{C}{R}$: $\dfrac{20}{250} = 0.08$

Step 3 – multiply by the constant: $\delta = 1718.87 \times 0.08$

Step 4 – evaluate in minutes: $\delta = 137.5'$

Step 5 – convert to degrees and minutes: $137.5' = 2°17.5'$

Final Answer: $\delta \approx 2°17.5' \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q19

Q20.

Solution

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

Step 1 – write the data: $R = 350$ m, $\Delta = 48°$.

Step 2 – convert the angle to radians: $\dfrac{\pi \times 48}{180} = \dfrac{48\pi}{180} = 0.8378$ rad

Step 3 – multiply by the radius: $L = 350 \times 0.8378$

Step 4 – evaluate: $L = 293.2$ m

Final Answer: $L \approx 293.2$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q20

Q21.

Solution

Concept – inclined tacheometric sight, staff vertical: The horizontal distance is $D = k\,s\cos^2\theta$ (with $C = 0$).

Step 1 – write the data: $k = 100$, $s = 1.250$ m, $\theta = 6°$.

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

Step 3 – square it: $\cos^2 6° = 0.98908$

Step 4 – form $k\,s$: $k\,s = 100 \times 1.250 = 125.0$ m

Step 5 – multiply by $\cos^2\theta$: $D = 125.0 \times 0.98908$

Step 6 – evaluate: $D = 123.6$ m

Final Answer: $D \approx 123.6$ m $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q21

Q22.

Solution

Concept – long chord of a circular curve: The long chord joining the two tangent points is $C = 2R\sin(\Delta/2)$.

Step 1 – halve the deflection angle: $\frac{\Delta}{2} = \frac{40°}{2} = 20°$

Step 2 – find the sine: $\sin 20° = 0.34202$

Step 3 – substitute into the formula: $C = 2 \times 500 \times 0.34202$

Step 4 – multiply the constants: $2 \times 500 = 1000$

Step 5 – evaluate: $C = 1000 \times 0.34202 = 342.0$ m

Final Answer: $C \approx 342$ m $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q22

Q23.

Solution

Concept – horizontal-sight tacheometry with an additive constant: $D = k\,s + C$ when the line of sight is horizontal.

Step 1 – write the data: $k = 100$, $s = 0.845$ m, $C = 0.30$ m.

Step 2 – form $k\,s$: $k\,s = 100 \times 0.845 = 84.5$ m

Step 3 – add the additive constant: $D = 84.5 + 0.30$

Step 4 – evaluate: $D = 84.8$ m

Why the other options are wrong:

- A: 84.5 m forgets the additive constant.
- B and D: use wrong arithmetic for the additive constant.

Final Answer: $D = 84.8 \text{ m} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept – zenith distance: The zenith distance is the complement of the altitude: $z = 90° - \text{altitude}$.

Step 1 – write the measured altitude: altitude $= 55°$

Step 2 – subtract from $90°$: $z = 90° - 55°$

Step 3 – evaluate: $z = 35°$

Why the other options are wrong:

- A: $145°$ adds instead of subtracting.
- B: $55°$ repeats the altitude.
- C: $90°$ is the zenith distance of a point on the horizon, not of a star at $55°$.

Final Answer: $z = 35° \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept – interior orientation: Interior orientation reconstructs the internal geometry of the camera at the instant of exposure, using the calibration data recorded on the photograph.

Step 1 – recall what is recovered: The photo-coordinate system is fixed by joining opposite fiducial marks; their intersection locates the principal point.

Step 2 – add the third element: Together with the calibrated focal length (principal distance) this defines the position of the perspective centre relative to the image plane.

Step 3 – distinguish from exterior orientation: The camera's ground position and its tilts belong to exterior orientation, not interior orientation.

Why the other options are wrong:

- A and D: exposure-station position and ground control are exterior-orientation quantities.
- B: the tilt angles ω and φ are exterior-orientation elements.

Final Answer: the principal point and calibrated focal length relative to the fiducial marks $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q25

Q26.

Solution

Concept – scale of a vertical photograph over elevated ground: Scale $= \dfrac{f}{H-h}$, where H is the flying height above datum and h is the ground elevation.

Step 1 – find the flying height above the ground: $H - h = 3000 - 600 = 2400$ m

Step 2 – write the focal length in metres: $f = 150 \text{ mm} = 0.150 \text{ m}$

Step 3 – form the scale ratio: Scale $= \dfrac{0.150}{2400}$

Step 4 – reduce to $1{:}n$**:** $\dfrac{0.150}{2400} = \dfrac{1}{16{,}000}$

Final Answer: $1{:}16{,}000 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q26

Q27.

Solution

Concept – relief displacement: On a vertical photograph a vertical object is displaced radially outward by $d = \dfrac{r\,h}{H}$.

Step 1 – write the data: $r = 100$ mm, $h = 50$ m, $H = 2500$ m.

Step 2 – multiply r by h: $r\,h = 100 \times 50 = 5000$

Step 3 – divide by H: $d = \dfrac{5000}{2500}$

Step 4 – evaluate (in mm, since r was in mm): $d = 2.0$ mm

Final Answer: $d = 2.0$ mm $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q27

Q28.

Solution

Concept – air base from format, scale and overlap: The ground covered by one photo is format $\times$ scale denominator; the air base is the portion not overlapped, $B = G\,(1 - \text{overlap})$.

Step 1 – ground coverage of one photo along the flight line: $G = 0.230$ m $\times$ $10{,}000 = 2300$ m

Step 2 – fraction not overlapped: $1 - 0.60 = 0.40$

Step 3 – multiply: $B = 2300 \times 0.40$

Step 4 – evaluate: $B = 920$ m

Final Answer: air base $= 920$ m $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q28

Q29.

Solution

Concept – object height from parallax difference: $h = \dfrac{H\,\Delta p}{P}$, where P is the absolute parallax at the base and Δp the parallax difference.

Step 1 – write the data: $H = 1500$ m, $\Delta p = 1.5$ mm, $P = 75$ mm.

Step 2 – multiply H by Δp: $H\,\Delta p = 1500 \times 1.5 = 2250$

Step 3 – divide by P: $h = \dfrac{2250}{75}$

Step 4 – evaluate: $h = 30$ m

Final Answer: $h = 30$ m $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q29

Q30.

Solution

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

Step 1 – write the data: photo length $= 60$ mm, scale $= 1{:}12{,}000$.

Step 2 – multiply: $60 \text{ mm} \times 12{,}000 = 720{,}000$ mm

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

Final Answer: ground length $= 720$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) 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 data: $f = 1.5 \times 10^{14}$ Hz.

Step 2 – divide the speed of light by the frequency: $\lambda = \dfrac{3 \times 10^8}{1.5 \times 10^{14}}$

Step 3 – divide the mantissas and subtract the exponents: $\dfrac{3}{1.5} = 2$ and $10^{8-14} = 10^{-6}$

Step 4 – combine: $\lambda = 2 \times 10^{-6}$ m

Step 5 – convert to micrometres: $\lambda = 2\ \mu$m (short-wave / near infrared).

Final Answer: $\lambda = 2\ \mu\text{m} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q31

Q32.

Solution

Concept – supervised versus unsupervised classifiers: Unsupervised methods cluster pixels by spectral similarity with no training data; supervised methods need the analyst to supply training samples.

Step 1 – test each classifier: Maximum-likelihood, minimum-distance and parallelepiped all require training statistics, so they are supervised.

Step 2 – identify the unsupervised one: K-means and its refinement ISODATA iteratively partition the feature space into clusters without any training data.

Final Answer: K-means / ISODATA clustering $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q32

Q33.

Solution

Concept – nature of unsupervised classification: It works "bottom-up": the algorithm finds natural groupings in the spectral data first, and only afterwards does the analyst attach meaning (land-cover labels) to the clusters.

Step 1 – describe the process: Pixels are automatically partitioned into spectrally homogeneous clusters (e.g. by K-means) with no prior class definitions.

Step 2 – describe the analyst's role: Only after clustering does the analyst inspect the clusters and assign informational class labels.

Why the other options are wrong:

- B: defining training areas first is the hallmark of *supervised* classification.
- C: unsupervised classification is not guaranteed to be more accurate.
- D: it does not require per-pixel ground truth.

Final Answer: it clusters pixels without training data, and labels are assigned afterwards $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q33

Q34.

Solution

Concept – Normalized Difference Vegetation Index: $\text{NDVI} = \dfrac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$.

Step 1 – write the reflectances: $\text{NIR} = 0.50$, $\text{Red} = 0.10$.

Step 2 – form the numerator: $0.50 - 0.10 = 0.40$

Step 3 – form the denominator: $0.50 + 0.10 = 0.60$

Step 4 – divide: $\text{NDVI} = \dfrac{0.40}{0.60}$

Step 5 – evaluate: $\text{NDVI} = 0.667$

Final Answer: NDVI $\approx 0.67 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q34

Q35.

Solution

Concept – number of clusters in K-means: K-means is a partitioning algorithm in which the number of clusters K is an input that must be chosen before the iterations start.

Step 1 – recall the algorithm: The method begins by placing K initial cluster centres, so K must be known in advance.

Step 2 – state the analyst's choice: The analyst specifies K (often guided by trial runs or prior knowledge of the scene).

Why the other options are wrong:

- A: the number is not chosen automatically in plain K-means.
- C: it need not equal the number of bands.
- D: it is not fixed at two.

Final Answer: specified in advance by the analyst $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q35

Q36.

Solution

Concept – ground resolution from IFOV: The nadir ground sample size equals the IFOV (in radians) multiplied by the sensor altitude.

Step 1 – write the data: IFOV $= 1.5$ mrad $= 1.5 \times 10^{-3}$ rad, altitude $H = 800$ km $= 800{,}000$ m.

Step 2 – multiply: GSD $= 1.5 \times 10^{-3} \times 800{,}000$

Step 3 – evaluate: GSD $= 1.5 \times 800 = 1200$ m

Final Answer: ground resolution ≈ 1200 m $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q36

Q37.

Solution

Concept – Moran's I and spatial autocorrelation: Moran's I ranges roughly from -1 to $+1$. A value near $+1$ means neighbouring locations tend to have similar values (clustering); near -1 means neighbours differ (a checkerboard); near 0 means randomness.

Step 1 – read the grid: High values (7–8) sit together on the left and low values (1–2) sit together on the right.

Step 2 – interpret $I \approx +1$: Similar values are spatially grouped, which is strong positive spatial autocorrelation.

Why the other options are wrong:

- A: randomness would give $I \approx 0$.
- B: alternating high/low neighbours would give a negative I.
- C: a uniform grid is not shown; values clearly vary.

Final Answer: strong positive spatial autocorrelation with similar values clustered $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q37

Q38.

Solution

Concept – Tobler's first law of geography: This law – "everything is related to everything else, but near things are more related than distant things" – underpins spatial autocorrelation and distance-weighted interpolation.

Step 1 – match the statement to its name: The quoted sentence is exactly Tobler's first law of geography.

Why the other options are wrong:

- A: map overlay is a GIS operation, not this law.
- B: the modifiable areal unit problem concerns how zoning of data changes results.
- D: the minimum mapping unit is the smallest feature mapped, unrelated to this statement.

Final Answer: Tobler's first law of geography $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q38

Q39.

Solution

Concept – uncompressed raster storage: Size $=$ rows $\times$ columns $\times$ bytes per cell.

Step 1 – count the cells: $2000 \times 1500 = 3{,}000{,}000$ cells

Step 2 – multiply by bytes per cell: $3{,}000{,}000 \times 1 = 3{,}000{,}000$ bytes

Step 3 – convert to megabytes (1 MB $= 1{,}048{,}576$ bytes): $\dfrac{3{,}000{,}000}{1{,}048{,}576} = 2.86$ MB

Step 4 – round to the nearest option: ≈ 3 MB

Final Answer: ≈ 3 MB $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q39

Q40.

Solution

Concept – vector versus raster data model: The vector model stores features as points, lines and polygons defined by coordinates, with explicit topology, giving precise boundaries and compact storage for discrete objects.

Step 1 – identify the true advantage: Sharp, exact boundaries and stored topology (adjacency, connectivity) are strengths of the vector model, and discrete features need little storage.

Why the other options are wrong:

- B: overlay of continuous surfaces is generally faster in the raster model.
- C: describing each location by a single grid cell is the raster model.
- D: the vector model represents lines directly (as its core element).

Final Answer: precise boundaries and explicit topology with efficient storage for discrete features $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q40

Q41.

Solution

Concept – inverse-distance weighting: In IDW the influence of a sample point falls off with distance, so the weight is proportional to $1/d^p$ with $p > 0$.

Step 1 – read the weighting law: Because the weight is $1/d^p$, a smaller distance d gives a larger weight.

Step 2 – state the consequence: Nearer sample points dominate the interpolated estimate; far points contribute little.

Why the other options are wrong:

- B: equal weighting ignores distance, which IDW does not.
- C: all points within the search neighbourhood contribute, not just the farthest.
- D: weight decreases, not increases, with distance.

Final Answer: nearer points are given greater weight $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q41

Q42.

Solution

Concept – dilution of precision (DOP): DOP measures how satellite geometry amplifies ranging errors into position errors. Smaller DOP (better) results when the satellites enclose a large volume as seen from the receiver.

Step 1 – relate geometry to DOP: GDOP is inversely related to the volume of the tetrahedron formed by the receiver-to-satellite unit vectors.

Step 2 – pick the best geometry: Satellites spread widely across the sky maximise that volume and so minimise GDOP.

Why the other options are wrong:

- A and B: clustered or one-sided satellites give a thin, low-volume figure and a large (poor) DOP.
- D: two satellites cannot give a 3-D fix, let alone good geometry.

Final Answer: well distributed across the sky (large tetrahedron volume) $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q42

Q43.

Solution

Concept – Bursa–Wolf (seven-parameter) transformation: This similarity transformation converts coordinates between two datums using seven parameters.

Step 1 – list the parameter groups: Three translations $(\Delta X, \Delta Y, \Delta Z)$ shift the origin.

Step 2 – add the rotations: Three small rotations $(\varepsilon_X, \varepsilon_Y, \varepsilon_Z)$ align the axes.

Step 3 – add the scale: One scale factor $(1 + s)$ accounts for a differential change in scale.

Step 4 – total: $3 + 3 + 1 = 7$ parameters.

Why the other options are wrong:

- B: three translations only is the simpler Molodensky/geocentric-translation model.
- C: two translations and two rotations is a 2-D-style set, not Bursa–Wolf.
- D: three separate scale factors describe an affine, not a similarity, transformation.

Final Answer: three translations, three rotations and one scale factor $\Rightarrow \boxed{\text{A}}$

Answer: (A) **Go Back to Q43**

Q44.

Solution

Concept – pseudorange from travel time: $\rho = c \times t$, the distance light covers in the measured travel time.

Step 1 – write the data: $t = 0.065$ s, $c = 3 \times 10^8$ m/s.

Step 2 – multiply: $\rho = 3 \times 10^8 \times 0.065$

Step 3 – evaluate: $\rho = 0.195 \times 10^8$ m

Step 4 – normalise: $\rho = 1.95 \times 10^7$ m

Step 5 – convert to kilometres: $\rho = 1.95 \times 10^4$ km $= 19{,}500$ km

Final Answer: $\rho \approx 19{,}500$ km $\Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q44**

Q45.

Solution

Concept – the scale parameter in Bursa–Wolf: The seventh parameter is a single scale factor, usually written as $(1 + s)$ with s in parts per million, that corrects a small uniform size difference between the two coordinate frames.

Step 1 – isolate the scale term: Of the seven parameters, three are translations, three are rotations, and one is this scale factor.

Step 2 – state its effect: It stretches or shrinks all coordinates uniformly by a tiny fraction (ppm level).

Why the other options are wrong:

- A: a Z-axis rotation is one of the three rotation parameters, not the scale.
- C: origin translation is handled by the three translation parameters.
- D: ellipsoid flattening is a defining constant of the ellipsoid, not a transformation parameter.

Final Answer: a small uniform difference in scale between the two systems $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q45

Q46.

Solution

Concept – the Transverse Mercator projection: UTM is based on the Transverse Mercator, a conformal projection formed by wrapping a cylinder about a meridian; it preserves angles and shapes locally, with the central meridian true to scale.

Step 1 – classify the projection surface: The developable surface is a transverse cylinder tangent (or secant) along a central meridian.

Step 2 – classify the property preserved: Because meridians and parallels meet at right angles and the point scale is the same in all directions, the projection is conformal (angle-preserving).

Why the other options are wrong:

- A: an equal-area projection preserves area, not shape, and TM is not equal-area.
- B: azimuthal equidistant is a different projection preserving distance from a centre.
- D: gnomonic is a perspective azimuthal projection on which great circles plot straight, again different from TM.

Final Answer: a conformal (transverse cylindrical) projection $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q46

Answer Key

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