Board Exam Desk

Geodetic Engineering Reviewer

Geodetic Engineering Licensure Examination | PRC | 120 original questions

2026 Edition | Updated November 2026

Original board-style practice questions with an answer key.

Practice questions

Mathematics

1. A spherical triangle has angles of 84°20′, 63°45′ and 52°10′. What is its spherical excess?

A. 10°15′
B. 200°15′
C. 19°45′
D. 20°15′

2. Two sides of a triangular lot measure 420 m and 560 m with an included angle of 74°30′. How long is the third side?

A. 603.57 m
B. 784.67 m
C. 700.00 m
D. 653.56 m

3. In triangle ABC, angle A = 48°, angle B = 67° and side a = 250 m. Find side b.

A. 201.83 m
B. 304.89 m
C. 253.92 m
D. 309.67 m

4. A triangular parcel has sides of 135 m, 172 m and 210 m. What is its area?

A. 23,145.83 m²
B. 11,610.00 m²
C. 11,572.91 m²
D. 14,175.00 m²

5. A rectangular lot beside a straight river is to be fenced on three sides only, using 600 m of fencing. What is the largest area that can be enclosed?

A. 40,000 m²
B. 22,500 m²
C. 30,000 m²
D. 45,000 m²

6. What is the perpendicular distance from the point (3, −2) to the line 4x − 3y + 12 = 0?

A. 4.80
B. 1.20
C. 7.50
D. 6.00

7. What is the radius of the circle $x^2 + y^2 - 6x + 8y - 11 = 0$?

A. 5
B. $\sqrt{11}$
C. 6
D. 4

8. Find the area bounded by the curve $y = x^2$, the x-axis and the line $x = 3$.

A. 27 square units
B. 6 square units
C. 4.5 square units
D. 9 square units

9. A right spherical triangle has C = 90°, with legs a = 40° and b = 55°. What is the hypotenuse c?

A. 63.94°
B. 58.88°
C. 68.01°
D. 58.23°

10. What is the sum of the interior angles of a closed nine-sided traverse?

A. 1,620°
B. 1,440°
C. 1,260°
D. 1,080°

11. A circle has a radius of 300 m. What is the length of the chord that subtends a central angle of 40°?

A. 205.21 m
B. 209.44 m
C. 192.84 m
D. 218.38 m

12. Convert an angle of 1.25 radians to degrees, minutes and seconds.

A. 71°37′11″
B. 79°34′39″
C. 75°00′00″
D. 71°15′00″

13. A line passes through (2, 5) and (8, −1). What is its angle of inclination?

A. 45°
B. 135°
C. −45°
D. 225°

14. A conical stockpile of sand has a base diameter of 12 m and a height of 4 m. What is its volume?

A. 452.39 m^3
B. 603.19 m^3
C. 226.19 m^3
D. 150.80 m^3

15. Solve for x in $2^{\blacksquare} = 50$.

A. 0.849
B. 25.000
C. 5.644
D. 3.398

16. In an oblique spherical triangle, sides b = 50° and c = 65° include angle A = 72°. Find side a.

A. 60.91°
B. 86.73°
C. 68.68°
D. 38.90°

17. Evaluate the determinant of the 3 × 3 matrix with rows (2, 1, 0), (1, 3, 1) and (0, 1, 2).

A. 10
B. 8
C. 12
D. 6

18. What is the limit of sin 3x / x as x approaches 0?

A. 1
B. 0
C. 1/3
D. 3

19. What are the coordinates of the focus of the parabola $y^2 = 12x$?

A. (0, 3)
B. (12, 0)
C. (3, 0)
D. (–3, 0)

20. An angle measures 75 grads (gons). What is its value in sexagesimal degrees?

A. 83°20′
B. 75°00′
C. 67°30′
D. 62°30′

Theory of Errors and Adjustment

21. A distance was taped five times: 245.32, 245.38, 245.35, 245.30 and 245.40 m. What is the standard deviation of a single measurement?

A. ±0.0412 m
B. ±0.0369 m
C. ±0.0184 m
D. ±0.0278 m

22. The standard deviation of a single angle observation is ±4.5″. What is the standard error of the mean of 9 such observations?

A. ±0.5″
B. ±13.5″
C. ±1.5″
D. ±3.0″

23. A measurement has a standard deviation of ±0.024 m. What is its probable error (50% error)?

A. ±0.0162 m
B. ±0.0395 m
C. ±0.0356 m
D. ±0.0470 m

24. The elevation of a benchmark was carried by three level routes: 152.340 m over 1 km, 152.380 m over 3 km and 152.410 m over 6 km. What is the most probable elevation?

A. 152.377 m
B. 152.357 m
C. 152.394 m
D. 152.346 m

25. An angle was measured with 2, 4 and 6 repetitions in three independent sets. In the weighted mean, the weights of the three sets are in the ratio

A. 1 : 2 : 3
B. 3 : 2 : 1
C. 1 : 4 : 9
D. 6 : 3 : 2

26. A distance is measured in 4 full tape lengths, each with an independent random error of ±0.010 m. What is the expected error of the total distance?

A. ±0.040 m
B. ±0.010 m
C. ±0.025 m
D. ±0.020 m

27. A rectangular lot measures 120.00 ± 0.03 m by 80.00 ± 0.02 m. What is the standard error of its computed area?

A. ±4.80 m²
B. ±3.61 m²
C. ±5.76 m²
D. ±3.39 m²

28. In a leveling line, the standard error per kilometer is ±6 mm. What is the expected standard error over a 9-km line?

A. ±54 mm
B. ±18 mm
C. ±12 mm
D. ±27 mm

29. The three measured angles of a plane triangle are 52°14′20″, 71°38′45″ and 56°07′10″, all of equal weight. What is the adjusted value of the second angle?

A. 71°38′40″
B. 71°38′50″
C. 71°38′30″
D. 71°38′45″

30. The angles of a triangle, measured with weights 2, 3 and 6, sum to 179°59′48″. How much correction should be applied to the angle with weight 2?

A. +2″
B. +4″
C. +6″
D. +2.2″

31. Which type of error in surveying follows the laws of probability and tends to partially cancel over many measurements?

A. Systematic error
B. Blunder or mistake
C. Constant instrumental error
D. Random (accidental) error

32. For a normally distributed measurement, what multiple of the standard deviation gives the 95% confidence interval?

A. 1.645σ
B. 0.6745σ
C. 2.576σ
D. 1.960σ

33. The method of least squares determines the most probable values of unknowns by minimizing

A. the sum of the absolute values of residuals
B. the largest single residual in the set
C. the algebraic sum of all the residuals
D. the sum of the weighted squares of the residuals

34. A least squares adjustment of a level network has 14 observations and 6 unknown elevations. How many degrees of freedom (redundancy) does it have?

A. 8
B. 20
C. 6
D. 14

35. A 500.000-m baseline is measured with an error of 0.050 m. What is the relative precision of the measurement?

A. 1 : 1,000
B. 1 : 10,000
C. 1 : 5,000
D. 1 : 25,000

36. A series of measurements are tightly clustered but all lie far from the true value. These measurements are best described as

A. precise but not accurate
B. accurate but not precise
C. both accurate and precise
D. neither precise nor biased

37. A slope distance of 250.000 ± 0.010 m is measured at a vertical angle of 8°00′ ± 20″. What is the standard error of the computed horizontal distance?

A. ±0.0133 m
B. ±0.0034 m
C. ±0.0262 m
D. ±0.0105 m

38. A single observation has a standard deviation of ±0.06 m. How many repeated observations are needed so that their mean has a standard error of ±0.02 m?

A. 3
B. 6
C. 12
D. 9

39. In a normal distribution of random errors, approximately what percentage of errors fall within ±1 standard deviation?

A. 50.0%
B. 95.4%
C. 68.3%
D. 90.0%

40. A least squares line y = mx + b is fitted to the points (1, 2.1), (2, 3.9), (3, 6.2) and (4, 7.8). What is the slope m?

A. 1.90
B. 2.00
C. 1.94
D. 1.42

Plane and Engineering Surveying

41. A 30-m tape is found to be 30.006 m long under standard conditions. A distance measured with it reads 425.60 m. What is the true distance?

A. 425.515 m
B. 425.606 m
C. 425.685 m
D. 425.600 m

42. A steel tape standardized at 20°C is used at 32°C to measure a 300.000-m line. With α = 0.0000116 per °C, what is the temperature correction?

A. –0.0418 m
B. +0.1114 m
C. +0.0418 m
D. +0.0042 m

43. A 30-m tape weighing 0.30 N/m is supported only at its ends under a pull of 80 N. What is the sag correction for one tape length?

A. 0.0475 m
B. 0.1406 m
C. 0.0158 m
D. 0.0316 m

44. A slope distance of 85.40 m is taped between two points whose difference in elevation is 6.20 m. What is the horizontal distance?

A. 85.175 m
B. 79.200 m
C. 85.625 m
D. 84.950 m

45. From a benchmark of elevation 105.320 m, a backsight of 1.845 m is taken, then a foresight of 2.630 m on point X. What is the elevation of X?

A. 104.535 m
B. 106.105 m
C. 109.795 m
D. 100.845 m

46. Using the combined curvature and refraction correction $h = 0.0675K^2$ (h in m, K in km), what is the correction for a sight of 3 km?

A. 0.608 m
B. 0.203 m
C. 0.707 m
D. 0.101 m

47. A stadia rod intercept of 1.85 m is read at a vertical angle of +6°00′ with a stadia constant of 100 and negligible additive constant. What is the horizontal distance?

A. 183.99 m
B. 182.98 m
C. 185.00 m
D. 19.23 m

48. A line has an azimuth of 236°15′ measured clockwise from north. What is its bearing?

A. S 33°45′ W
B. S 56°15′ W
C. N 56°15′ W
D. S 56°15′ E

49. A traverse line is 320.50 m long with a bearing of N 35°20′ E. What are its latitude and departure?

A. +185.36 m, +261.46 m
B. +261.46 m, +185.36 m
C. +261.46 m, –185.36 m
D. –261.46 m, +185.36 m

50. A closed traverse with a perimeter of 1,500 m has a sum of latitudes of +0.18 m and a sum of departures of –0.24 m. What is its relative precision?

A. 1 : 3,571
B. 1 : 6,250
C. 1 : 5,000
D. 1 : 8,333

51. A closed traverse with a perimeter of 1,500 m has a total latitude misclosure of +0.18 m. By the compass (Bowditch) rule, what latitude correction goes to a 420-m side?

A. +0.0504 m
B. –0.0504 m
C. –0.0450 m
D. –0.0064 m

52. A four-sided lot has corner coordinates (in metres, E and N) of (0, 0), (240, 30), (260, 210) and (40, 180), taken in order. What is its area?

A. 81,000 m²
B. 43,200 m²
C. 38,100 m²
D. 40,500 m²

53. Offsets from a survey line to a curved boundary, taken at 10-m intervals, are 4.2, 6.8, 7.5, 5.9 and 3.6 m. What is the area by Simpson's one-third rule?

A. 241.00 m²
B. 280.00 m²
C. 210.67 m²
D. 245.33 m²

54. A simple circular curve has a radius of 250 m and an intersection angle of 38°. What is its tangent distance?

A. 165.81 m
B. 86.08 m
C. 81.39 m
D. 195.32 m

55. The PI of a simple curve is at station 10+250.00. The curve has R = 300 m and I = 42°. What is the station of the PT?

A. 10+365.16
B. 10+469.91
C. 10+134.84
D. 10+354.75

56. A symmetrical parabolic vertical curve 200 m long joins a +3% grade to a −2% grade. How far from the PVC is the highest point of the curve?

A. 100 m
B. 120 m
C. 80 m
D. 150 m

57. Two cross sections 20 m apart have end areas of 42.5 m² and 58.3 m². What is the earthwork volume by the average end area method?

A. 1,008 m³
B. 2,016 m³
C. 1,166 m³
D. 850 m³

58. A line has a magnetic bearing of N 25°30′ E where the magnetic declination is 2°15′ W. What is its true bearing?

A. N 27°45′ E
B. N 23°15′ E
C. N 25°30′ E
D. N 23°15′ W

59. Reciprocal leveling across a wide river gives an apparent elevation difference of 1.264 m from one bank and 1.238 m from the other. What is the true difference in elevation?

A. 1.264 m
B. 1.251 m
C. 0.013 m
D. 2.502 m

60. In a hydrographic survey, a sounding of 12.6 m is taken when the tide gauge reads 1.8 m above chart datum. What is the reduced depth below chart datum?

A. 14.4 m
B. 10.8 m
C. 12.6 m
D. 11.7 m

Geodesy and Geodetic Surveying

61. An ellipsoid has a semi-major axis of 6,378,137.000 m and flattening 1/298.257223563. What is its semi-minor axis?

A. 6,335,367.628 m
B. 6,356,752.314 m
C. 6,356,823.773 m
D. 6,367,435.680 m

62. For an ellipsoid with flattening f = 1/298.257223563, what is the first eccentricity squared, e^2?

A. 0.00669438
B. 0.00335281
C. 0.00001124
D. 0.00670562

63. On the WGS 84 ellipsoid (a = 6,378,137 m, e^2 = 0.00669438), what is the prime vertical radius of curvature N at latitude 15°N?

A. 6,339,703 m
B. 6,376,707 m
C. 6,398,150 m
D. 6,379,568 m

64. On the WGS 84 ellipsoid (a = 6,378,137 m, e^2 = 0.00669438), what is the meridian radius of curvature M at latitude 12°N?

A. 6,379,060 m
B. 6,335,439 m
C. 6,338,190 m
D. 6,337,273 m

65. Treating the Earth as a sphere of radius 6,371 km, what is the length of one degree of longitude along the parallel of 14°N?

A. 111.19 km
B. 26.90 km
C. 107.89 km
D. 114.60 km

66. A geodetic triangle covers an area of 500 km^2 on a sphere of radius 6,371 km. What is its spherical excess?

A. 1.27″
B. 16.19″
C. 2.54″
D. 7.62″

67. A GNSS receiver gives an ellipsoidal height of 85.420 m at a point where the geoid undulation is +46.150 m. What is the orthometric height?

A. 131.570 m
B. 39.270 m
C. 46.150 m
D. –39.270 m

68. In the Philippine Transverse Mercator (PTM) projection, each zone spans how many degrees of longitude?

A. 3°
B. 6°
C. 2°
D. 1°30′

69. What is the scale factor at the central meridian of a Universal Transverse Mercator (UTM) zone?

A. 0.9996
B. 0.99995
C. 1.0004
D. 1.0000

70. A ground distance of 1,500.000 m is measured at a mean elevation of 600 m. With R = 6,371,000 m and a grid scale factor of 0.99995, what is the grid distance?

A. 1,499.925 m
B. 1,500.066 m
C. 1,499.784 m
D. 1,499.934 m

71. The geoid is best described as

A. the mathematical ellipsoid used for coordinates
B. the physical topographic surface of the Earth
C. the equipotential surface that best fits mean sea level
D. the plane tangent to the Earth at a station

72. What is the minimum number of GNSS satellites needed for a three-dimensional position fix by code pseudoranging?

A. 4
B. 3
C. 5
D. 6

73. Ignoring refraction and treating the Earth as a sphere of radius 6,371 km, how far is the horizon from an observer whose eye is 50 m above sea level?

A. 17.85 km
B. 27.22 km
C. 50.48 km
D. 25.24 km

74. Two meridians are 1° apart in longitude. Approximately how much do they converge (angle between them) at latitude 14°N?

A. 58.2′
B. 15.0′
C. 14.5′
D. 60.0′

75. On a sphere of radius 6,371 km, what is the great-circle distance between 14°36′N, 121°00′E and 10°18′N, 123°54′E?

A. 478 km
B. 801 km
C. 309 km
D. 572 km

76. A station where both astronomic and geodetic azimuths and longitudes are determined, so that the deflection of the vertical can be used to control azimuths, is called a

A. Doppler station
B. Tidal benchmark
C. Laplace station
D. Bilby station

77. Which reference ellipsoid is used by the Philippine Reference System of 1992 (PRS92)?

A. GRS 1980
B. WGS 1984
C. Everest 1830
D. Clarke 1866

78. An observer measures the altitude of the celestial pole as 14°35′ (after corrections). What is the observer's latitude?

A. 75°25′ N
B. 14°35′ N
C. 14°35′ S
D. 29°10′ N

79. Philippine Standard Time is based on the 120°E meridian. By how much is local mean time at longitude 121°E ahead of standard time?

A. 1 hour
B. 4 minutes
C. 15 minutes
D. 1 minute

80. At upper transit the Sun has a declination of +5°20′ and is observed with a zenith distance of 9°10′ south of the zenith. What is the observer's latitude?

A. 3°50′ N
B. 14°30′ N
C. 3°50′ S
D. 84°40′ N

Photogrammetry and Remote Sensing

81. A vertical photograph is taken with a 152-mm camera from 2,500 m above datum over terrain at 220 m elevation. What is the photo scale over that terrain?

A. 1 : 16,447
B. 1 : 13,816
C. 1 : 14,474
D. 1 : 15,000

82. A 1:12,000 average scale is required with a 153-mm camera over terrain averaging 300 m elevation. What flying height above datum is needed?

A. 1,836 m
B. 1,536 m
C. 2,136 m
D. 484 m

83. The top of a 60-m tower appears 95 mm from the principal point of a vertical photo taken 1,800 m above the tower's base. What is the relief displacement?

A. 3.17 mm
B. 3.06 mm
C. 2.85 mm
D. 3.28 mm

84. On a vertical photo taken 2,400 m above the base of a chimney, the chimney top is 84.0 mm from the principal point and its relief displacement is 4.2 mm. How tall is the chimney?

A. 126.3 m
B. 114.3 m
C. 100.8 m
D. 120.0 m

85. In a stereopair flown 3,000 m above datum, point A at 200 m elevation has a parallax of 88.50 mm. Point B has a parallax 2.30 mm larger. How much higher is B than A?

A. 70.93 m
B. 72.77 m
C. 75.99 m
D. 74.71 m

86. A 230 mm × 230 mm vertical photo has a scale of 1:20,000. What ground area does one photo cover?

A. 21.16 km²
B. 4.60 km²
C. 10.58 km²
D. 42.32 km²

87. Photos 230 mm square at 1:20,000 scale are flown with 60% forward overlap. What is the air base between exposures?

A. 2.76 km
B. 1.84 km
C. 4.60 km
D. 1.38 km

88. Photos 230 mm square at 1:15,000 scale are flown with 30% sidelap. What is the spacing between adjacent flight lines?

A. 1,035 m
B. 3,450 m
C. 1,380 m
D. 2,415 m

89. A digital aerial camera with 12-µm pixels and a 100-mm lens flies 1,500 m above the ground. What is the ground sample distance?

A. 0.12 m
B. 0.08 m
C. 1.80 m
D. 0.18 m

90. By Wien's displacement law, at about what wavelength does a surface at 300 K emit its peak radiation?

A. 9.66 µm
B. 0.97 µm
C. 3.00 µm
D. 0.48 µm

91. A pixel has near-infrared reflectance of 0.52 and red reflectance of 0.08. What is its NDVI?

A. 0.733
B. –0.733
C. 6.500
D. 0.440

92. Healthy green vegetation is most strongly distinguished in multispectral imagery by its

A. high reflectance in the blue band
B. strong absorption in near-infrared
C. high reflectance in the red band
D. high reflectance in the near-infrared band

93. Why can synthetic aperture radar (SAR) image the ground through cloud cover?

A. It senses emitted thermal energy
B. It uses only visible wavelengths
C. It is an active microwave sensor
D. It records reflected ultraviolet light

94. A sensor records data with 11-bit radiometric resolution. How many distinct brightness levels can each pixel have?

A. 1,024
B. 2,048
C. 4,096
D. 256

95. In conventional aerial mapping, the standard forward overlap (endlap) between successive photos for stereoscopic coverage is about

A. 30%
B. 60%
C. 15%
D. 90%

96. On a metric aerial photograph, the principal point is located by

A. finding the image of the nadir
B. intersecting tilt displacements
C. averaging control point positions
D. joining opposite fiducial marks

97. On a truly vertical aerial photograph, relief displacement of an object occurs

A. parallel to the flight line
B. radially toward the isocenter
C. perpendicular to the flight line
D. radially from the principal point

98. An aircraft flies at a ground speed of 200 km/h with an air base of 1.84 km. What is the time interval between exposures?

A. 33.1 s
B. 9.2 s
C. 0.6 s
D. 2.6 s

99. A LiDAR pulse returns 10.0 μs after it is emitted. What is the range to the target?

A. 2,998 m
B. 1,499 m
C. 150 m
D. 749 m

100. An orthophoto differs from an ordinary aerial photograph because it has been corrected for

A. atmospheric haze only
B. relief and tilt displacement
C. lens color aberration only
D. film shrinkage only

Property Registration and Land Laws

101. Presidential Decree No. 1529, which governs the registration of land titles and deeds in the Philippines, is known as the

A. Public Land Act
B. Property Registration Decree
C. Cadastral Act
D. Land Registration Act

102. Commonwealth Act No. 141, which governs the classification and disposition of alienable lands of the public domain, is known as the

A. Property Registration Decree
B. Water Code of the Philippines
C. Public Land Act
D. Land Registration Act

103. Republic Act No. 8560 regulates the practice of geodetic engineering in the Philippines. It is titled the

A. Philippine Surveying Act of 1998
B. Philippine Geodetic Engineering Act of 1998
C. Geodetic Licensure Code of 1992
D. Land Surveyors Practice Act of 1995

104. The principle that all lands of the public domain belong to the State, the source of any asserted right of ownership, is the

A. Torrens principle
B. Doctrine of accretion
C. Mirror principle
D. Regalian doctrine

105. Under the 1987 Constitution, which class of lands of the public domain may be alienated?

A. Forest or timber lands
B. Mineral lands
C. National parks
D. Agricultural lands only

106. Under the 1987 Constitution, private corporations may hold alienable lands of the public domain only by lease. What is the maximum area?

A. 500 hectares
B. 12 hectares
C. 1,000 hectares
D. 24 hectares

107. Under the 1987 Constitution, Filipino citizens may acquire alienable lands of the public domain by purchase, homestead or grant up to a maximum of

A. 24 hectares
B. 500 hectares
C. 12 hectares
D. 5 hectares

108. The Torrens system of land registration was originally devised by Sir Robert Torrens in

A. South Australia
B. England
C. New Zealand
D. the United States

109. Which law first introduced the Torrens system of land registration in the Philippines?

A. Act No. 496
B. Act No. 2259
C. Presidential Decree No. 1529
D. Commonwealth Act No. 141

110. Under PD 1529, a person deprived of land by a decree of registration obtained through actual fraud may petition to reopen the decree within

A. six months from issuance of title
B. one year from entry of the decree
C. two years from entry of the decree
D. ten years from the date of fraud

111. Under the Civil Code, soil gradually deposited along the bank of a river by the effect of the current belongs to

A. the State as public domain
B. the municipality where it lies
C. the owner of the adjoining riparian land
D. the first person to occupy it

112. When the current of a river suddenly detaches a known portion of land and carries it to another estate, the original owner keeps ownership provided he removes it within

A. two years
B. one year
C. five years
D. six months

113. Under the Water Code, the banks of rivers and streams in urban areas are subject to an easement of public use along their entire length for a width of

A. 3 meters
B. 20 meters
C. 40 meters
D. 10 meters

114. Under the Water Code, what is the width of the easement of public use along the banks of rivers in agricultural areas?

A. 3 meters
B. 40 meters
C. 20 meters
D. 30 meters

115. A cadastral proceeding for the registration of lands differs from ordinary registration because it is

A. initiated by the government
B. filed by the individual owner
C. limited to lands under 12 hectares
D. decided by the Register of Deeds

116. A notice of lis pendens annotated on a certificate of title serves to announce that

A. the title has been cancelled
B. the property is subject of pending litigation
C. the owner's duplicate is lost
D. the land is mortgaged to a bank

117. Under the Torrens system, the first certificate issued after a decree of original registration is the

A. Original Certificate of Title
B. Transfer Certificate of Title
C. Tax Declaration
D. Certificate of Land Transfer

118. Under PD 1529, what is the operative act that binds registered land and affects third persons in a voluntary dealing?

A. Notarization of the deed
B. Payment of the purchase price
C. Registration with the Register of Deeds
D. Physical delivery of possession

119. Under PD 1529, can registered land be acquired by acquisitive prescription or adverse possession?

A. Yes, after ten years of good-faith possession
B. No, title to registered land cannot be lost by prescription
C. Yes, after thirty years of possession
D. Only if the possessor pays real property tax

120. Under the Civil Code, river beds abandoned through a natural change in the course of the waters belong to

A. the State as part of the public domain
B. the owners whose lands are occupied by the new course
C. the owners of the lands along the old bed
D. the local government unit concerned

Answer key

Geodetic Engineering

1. D. 20°15′

Spherical excess E = (A + B + C) – 180° = 200°15′ – 180° = 20°15′.

2. A. 603.57 m

Law of cosines: $c^2 = 420^2 + 560^2 – 2(420)(560)\cos 74°30′$, so c = 603.57 m.

3. D. 309.67 m

Law of sines: b = a sin B / sin A = 250 sin 67° / sin 48° = 309.67 m.

4. C. 11,572.91 m²

Heron's formula: s = 258.5 m and $A = \sqrt{[s(s–a)(s–b)(s–c)]} = 11{,}572.91$ m².

5. D. 45,000 m²

With side x perpendicular to the river, A = x(600 – 2x); dA/dx = 600 – 4x = 0 gives x = 150 m, so A = 150 × 300 = 45,000 m².

6. D. 6.00

$d = |4(3) – 3(–2) + 12| / \sqrt{(4^2 + 3^2)} = 30/5 = 6.00$.

7. C. 6

Completing squares gives $(x – 3)^2 + (y + 4)^2 = 11 + 9 + 16 = 36$, so r = 6.

8. D. 9 square units

$A = \int_0^3 x^2\,dx = x^3/3$ from 0 to 3 = 27/3 = 9 square units.

9. A. 63.94°

Napier's rule: cos c = cos a cos b = cos 40° cos 55° = 0.4394, so c = 63.94°.

10. C. 1,260°

Sum of interior angles = (n – 2)(180°) = 7 × 180° = 1,260°.

11. A. 205.21 m

Chord = 2R sin(θ/2) = 2(300) sin 20° = 205.21 m.

12. A. 71°37′11″

Degrees = 1.25 × 180/π = 71.61972° = 71°37′11″.

13. B. 135°

Slope m = (–1 – 5)/(8 – 2) = –1; the inclination θ satisfies tan θ = –1 with θ between 0° and 180°, so θ = 135°.

14. D. 150.80 m³

$V = \pi r^2 h/3 = \pi(6^2)(4)/3 = 150.80$ m³.

15. C. 5.644

x = log 50 / log 2 = 1.6990/0.3010 = 5.644.

16. A. 60.91°

Spherical law of cosines for sides: cos a = cos b cos c + sin b sin c cos A = 0.4862, so a = 60.91°.

17. B. 8

Expanding along row 1: 2(3·2 – 1·1) – 1(1·2 – 1·0) + 0 = 10 – 2 = 8.

18. D. 3

Write $\sin 3x / x = 3 (\sin 3x / 3x)$; since $\sin u / u \to 1$, the limit is 3.

19. C. (3, 0)

Comparing with $y^2 = 4ax$ gives $4a = 12$, $a = 3$, so the focus is at (3, 0).

20. C. 67°30′

400 grads = 360°, so 75 grads × 0.9 = 67.5° = 67°30′.

21. A. ±0.0412 m

Mean = 245.350 m; $\Sigma v^2 = 0.0068$; $s = \sqrt{(\Sigma v^2/(n - 1))} = \pm 0.0412$ m.

22. C. ±1.5″

Standard error of the mean = $\sigma/\sqrt{n} = 4.5''/\sqrt{9} = \pm 1.5''$.

23. A. ±0.0162 m

Probable error = $0.6745\sigma = 0.6745 \times 0.024 = \pm 0.0162$ m.

24. B. 152.357 m

Weights are inversely proportional to route length (1, 1/3, 1/6); weighted mean = $\Sigma wh/\Sigma w = 152.357$ m.

25. A. 1 : 2 : 3

Weights of angle values are directly proportional to the number of repetitions: 2 : 4 : 6 = 1 : 2 : 3.

26. D. ±0.020 m

Random errors add in quadrature: $E = \pm 0.010\sqrt{4} = \pm 0.020$ m.

27. D. ±3.39 m²

$\sigma A = \sqrt{[(W \cdot \sigma L)^2 + (L \cdot \sigma W)^2]} = \sqrt{[(80 \times 0.03)^2 + (120 \times 0.02)^2]} = \pm 3.39$ m².

28. B. ±18 mm

Leveling error grows with the square root of distance: $6\sqrt{9} = \pm 18$ mm.

29. A. 71°38′40″

Sum = 180°00′15″, so the misclosure of +15″ is split equally (–5″ each): 71°38′45″ – 5″ = 71°38′40″.

30. C. +6″

Corrections are inversely proportional to weight: $12'' \times (1/2)/(1/2 + 1/3 + 1/6) = +6''$.

31. D. Random (accidental) error

Random errors are equally likely to be positive or negative, so they partially compensate; systematic errors accumulate.

32. D. 1.960σ

About 95% of a normal distribution lies within ±1.960σ; 1.645σ gives 90% and 2.576σ gives 99%.

33. D. the sum of the weighted squares of the residuals

Least squares minimizes Σwv^2, giving the most probable values under normally distributed random errors.

34. A. 8

Redundancy $r = n - u = 14 - 6 = 8$.

35. B. 1 : 10,000

Relative precision = error/distance = 0.050/500 = 1/10,000.

36. A. precise but not accurate

Precision is closeness of repeated values to each other; accuracy is closeness to the true value, so a bias makes them precise yet inaccurate.

37. D. ±0.0105 m

$H = S \cos \alpha$; $\sigma H = \sqrt{[(\cos \alpha\ \sigma S)^2 + (S \sin \alpha\ \sigma\alpha)^2]}$ with $\sigma\alpha = 20''/206{,}265$ rad, giving ±0.0105 m.

38. D. 9

$\sigma(\text{mean}) = \sigma/\sqrt{n}$, so $n = (0.06/0.02)^2 = 9$.

39. C. 68.3%

About 68.27% of a normal distribution lies within ±1σ; 50% lies within the probable error (±0.6745σ).

40. C. 1.94

$m = (n\Sigma xy - \Sigma x\Sigma y)/(n\Sigma x^2 - (\Sigma x)^2) = (4 \times 59.7 - 10 \times 20.0)/(4 \times 30 - 100) = 1.94$.

41. C. 425.685 m

True length = measured × (actual tape length/nominal length) = 425.60 × 30.006/30 = 425.685 m.

42. C. +0.0418 m

$Ct = \alpha L(T - Ts) = 0.0000116 \times 300 \times 12 = +0.0418$ m; the tape expands, so the measured value is too short.

43. C. 0.0158 m

$Cs = w^2L^3/(24P^2) = (0.30)^2(30)^3/[24(80)^2] = 0.0158$ m, subtracted from the measured length.

44. A. 85.175 m

$H = \sqrt{(S^2 - h^2)} = \sqrt{(85.40^2 - 6.20^2)} = 85.175$ m.

45. A. 104.535 m

HI = 105.320 + 1.845 = 107.165 m; elevation of X = HI – FS = 107.165 – 2.630 = 104.535 m.

46. A. 0.608 m

$h = 0.0675(3)^2 = 0.6075 \approx 0.608$ m.

47. B. 182.98 m

$H = Ks \cos^2\alpha = 100(1.85)\cos^2 6° = 182.98$ m.

48. B. S 56°15′ W

In the third quadrant, bearing = azimuth – 180° = 56°15′ measured from south toward west: S 56°15′ W.

49. B. +261.46 m, +185.36 m

Latitude = $L \cos \beta$ = 261.46 m (north, +); departure = $L \sin \beta$ = 185.36 m (east, +).

50. C. 1 : 5,000

Linear error of closure = $\sqrt{(0.18^2 + 0.24^2)} = 0.30$ m; precision = 0.30/1,500 = 1/5,000.

51. B. –0.0504 m

Correction = –(misclosure)(side length/perimeter) = –0.18 × 420/1,500 = –0.0504 m.

52. D. 40,500 m²

Coordinate (shoelace) method: $A = \frac{1}{2}|\Sigma(x_1y_2 - x_2y_1)| = 40{,}500$ m².

53. D. 245.33 m²

$A = (d/3)[h_1 + 4(h_2 + h_4) + 2h_3 + h_5] = (10/3)(4.2 + 50.8 + 15.0 + 3.6) = 245.33$ m².

54. B. 86.08 m

T = R tan(I/2) = 250 tan 19° = 86.08 m.

55. D. 10+354.75

T = 300 tan 21° = 115.16 m and L = πRI/180 = 219.91 m; PC = 10+134.84 and PT = PC + L = 10+354.75.

56. B. 120 m

x = g■L/(g■ – g■) = 3(200)/(3 + 2) = 120 m from the PVC.

57. A. 1,008 m³

V = L(A■ + A■)/2 = 20(42.5 + 58.3)/2 = 1,008 m³.

58. B. N 23°15′ E

With a west declination, true bearing = magnetic bearing – declination for NE lines: 25°30′ – 2°15′ = N 23°15′ E.

59. B. 1.251 m

Reciprocal leveling cancels curvature, refraction and collimation errors by averaging: (1.264 + 1.238)/2 = 1.251 m.

60. B. 10.8 m

Reduced sounding = observed depth – tide height above datum = 12.6 – 1.8 = 10.8 m.

61. B. 6,356,752.314 m

b = a(1 – f) = 6,378,137 × (1 – 1/298.257223563) = 6,356,752.314 m.

62. A. 0.00669438

$e^2 = 2f – f^2 = 0.00669438$.

63. D. 6,379,568 m

$N = a/\sqrt{(1 – e^2 \sin^2\phi)} = 6,378,137/\sqrt{(1 – 0.00669438 \sin^2 15°)} = 6,379,568$ m.

64. C. 6,338,190 m

$M = a(1 – e^2)/(1 – e^2 \sin^2\phi)^{(3/2)} = 6,338,190$ m.

65. C. 107.89 km

Arc = R(Δλ in radians)cos ϕ = 6,371 × 0.0174533 × cos 14° = 107.89 km.

66. C. 2.54″

E (radians) = A/R^2, so E″ = $500/6,371^2 \times 206,265 = 2.54″$.

67. B. 39.270 m

h = H + N, so H = h – N = 85.420 – 46.150 = 39.270 m.

68. C. 2°

PTM uses five 2°-wide zones with central meridians at 117°, 119°, 121°, 123° and 125° E.

69. A. 0.9996

UTM uses a central-meridian scale factor of 0.9996 so that the scale is exact along two lines about 180 km either side.

70. C. 1,499.784 m

Grid = ground × elevation factor × scale factor = 1,500 × [R/(R + h)] × 0.99995 = 1,499.784 m.

71. C. the equipotential surface that best fits mean sea level

The geoid is a level (equipotential) surface of the Earth's gravity field that approximates global mean sea level.

72. A. 4

Four unknowns must be solved, the three coordinates and the receiver clock offset, so four satellites are needed.

73. D. 25.24 km

$d = \sqrt{(2Rh)} = \sqrt{(2 \times 6{,}371{,}000 \times 50)} = 25{,}241$ m ≈ 25.24 km.

74. C. 14.5′

Convergence $\gamma \approx \Delta\lambda \sin \phi = 60' \times \sin 14° = 14.5'$.

75. D. 572 km

$\cos d = \sin \phi\blacksquare \sin \phi\blacksquare + \cos \phi\blacksquare \cos \phi\blacksquare \cos \Delta\lambda = 0.995966$; $d = 5.1483° \times (\pi/180) \times 6{,}371 = 572$ km.

76. C. Laplace station

Laplace stations apply the Laplace equation linking astronomic and geodetic azimuth through the difference in longitude and latitude.

77. D. Clarke 1866

PRS92 retained the Clarke 1866 ellipsoid of the old Luzon Datum, with published parameters for transforming to WGS 84.

78. B. 14°35′ N

The altitude of the elevated celestial pole equals the observer's latitude.

79. B. 4 minutes

The Earth turns 15° per hour, or 1° per 4 minutes, so 1° east of the standard meridian is 4 minutes ahead.

80. B. 14°30′ N

With the Sun south of the zenith, $\phi = \delta + z = 5°20' + 9°10' = 14°30'$ N.

81. D. 1 : 15,000

$S = f/(H - h) = 0.152/(2{,}500 - 220) = 0.152/2{,}280 = 1/15{,}000$.

82. C. 2,136 m

$H = f/S + h = 0.153 \times 12{,}000 + 300 = 2{,}136$ m.

83. A. 3.17 mm

$d = rh/H = 95 \times 60/1{,}800 = 3.17$ mm.

84. D. 120.0 m

$h = dH/r = 4.2 \times 2{,}400/84.0 = 120.0$ m.

85. A. 70.93 m

$\Delta h = (H - hA)\Delta p/(pA + \Delta p) = 2{,}800 \times 2.30/90.80 = 70.93$ m.

86. A. 21.16 km²

Each side covers $0.230 \times 20{,}000 = 4{,}600$ m, so the area is 4.6 km × 4.6 km = 21.16 km².

87. B. 1.84 km

Air base $B = (1 - 0.60) \times 0.230 \times 20{,}000 = 0.40 \times 4{,}600 = 1{,}840$ m.

88. D. 2,415 m

Ground width $= 0.230 \times 15{,}000 = 3{,}450$ m; flight-line spacing $= (1 - 0.30) \times 3{,}450 = 2{,}415$ m.

89. D. 0.18 m

GSD = pixel size × H/f = $0.000012 \times 1{,}500/0.100 = 0.18$ m.

90. A. 9.66 μm

λmax = 2,898 μm·K / T = 2,898/300 ≈ 9.66 μm, in the thermal infrared.

91. A. 0.733

NDVI = (NIR – Red)/(NIR + Red) = 0.44/0.60 = 0.733.

92. D. high reflectance in the near-infrared band

Leaf cell structure strongly reflects near-infrared light, while chlorophyll absorbs red and blue light.

93. C. It is an active microwave sensor

SAR transmits its own microwave pulses, and microwaves pass through clouds largely unaffected, by day or night.

94. B. 2,048

Number of levels = 2■ = 2^{11} = 2,048.

95. B. 60%

About 60% endlap ensures every ground point appears on at least two photos for stereo viewing; sidelap is typically around 30%.

96. D. joining opposite fiducial marks

Lines joining opposite fiducial marks intersect at (or very near) the principal point.

97. D. radially from the principal point

On a vertical photo the nadir coincides with the principal point, and relief displacement is radial from that point.

98. A. 33.1 s

Ground speed = 200/3.6 = 55.56 m/s; interval = 1,840/55.56 = 33.1 s.

99. B. 1,499 m

Range = ct/2 = 299,792,458 × 10.0 × 10■■ / 2 = 1,499 m.

100. B. relief and tilt displacement

Differential rectification with an elevation model removes tilt and relief displacement, giving uniform map scale.

101. B. Property Registration Decree

PD 1529 (1978) is the Property Registration Decree; it amended and codified the laws on registration under the Torrens system.

102. C. Public Land Act

CA 141 (1936) is the Public Land Act, providing modes of disposition such as homestead, sale and free patent.

103. B. Philippine Geodetic Engineering Act of 1998

RA 8560 is the Philippine Geodetic Engineering Act of 1998, which created the regulatory framework for the profession.

104. D. Regalian doctrine

Under the Regalian doctrine, embodied in the Constitution, lands not clearly in private ownership are presumed to belong to the State.

105. D. Agricultural lands only

The Constitution classifies public lands into agricultural, forest or timber, mineral lands and national parks; only agricultural lands may be alienated.

106. C. 1,000 hectares

Article XII, Section 3 limits leases by private corporations to not more than 1,000 hectares, for 25 years renewable for another 25.

107. C. 12 hectares

Article XII, Section 3 allows citizens to lease up to 500 hectares but to acquire by purchase, homestead or grant not more than 12 hectares.

108. A. South Australia

Robert Torrens introduced the system in South Australia in 1858; it was later adopted in the Philippines.

109. A. Act No. 496

Act No. 496, the Land Registration Act of 1902, introduced the Torrens system; it was later superseded by PD 1529.

110. B. one year from entry of the decree

Section 32 of PD 1529 allows a petition for reopening and review on the ground of actual fraud within one year from entry of the decree.

111. C. the owner of the adjoining riparian land

Article 457 grants to riparian owners the accretion they gradually receive from the effects of the current of the waters.

112. A. two years

Under Article 459 of the Civil Code (avulsion), the owner retains ownership of the segregated portion if he removes it within two years.

113. A. 3 meters

Article 51 of PD 1067 sets the easement at 3 m in urban areas, 20 m in agricultural areas and 40 m in forest areas.

114. C. 20 meters

Article 51 of PD 1067 prescribes 20 m for agricultural areas, compared with 3 m in urban and 40 m in forest areas.

115. A. initiated by the government

In cadastral proceedings the government, after a cadastral survey, petitions the court so that all claimants in the area must prove their claims.

116. B. the property is subject of pending litigation

Lis pendens warns third persons that the property is involved in a pending court action and that they deal with it at their own risk.

117. A. Original Certificate of Title

The OCT is issued pursuant to the decree of registration; later conveyances result in Transfer Certificates of Title.

118. C. Registration with the Register of Deeds

Section 51 of PD 1529 makes the act of registration the operative act to convey or affect registered land as against third persons.

119. B. No, title to registered land cannot be lost by prescription

Section 47 of PD 1529 provides that no title to registered land in derogation of the registered owner shall be acquired by prescription or adverse possession.

120. B. the owners whose lands are occupied by the new course

Article 461 gives abandoned beds to owners whose lands are newly occupied, in proportion to the area lost.

Topics to review

- Traverse closure and survey adjustments
- Coordinate systems and projections
- GNSS, remote sensing and mapping
- Land boundaries, surveying law and records

Online question banks and study resources

Geodetic Engineering - Pass Harbor (Question bank)

Official PRC board information

Current PRC exam programs

Independent study material prepared by Board Exam Desk.