

2023 Dynamic Planet Beachwood Invitational

Answer Key

- 1. C
- 2. B
- 3. B 43. b
- 4. C 44. c
- 5. A 45. c
- 6. B 46. a
- 7. C 47. a
- 8. B 48. d
- 9. A 49. c
- 10. B 50. c
- 11. D 51. 130 ft³/s
- 12. A 52. A. dendritic B. centripetal C. annular D. trellised E. rectangular F. parallel_____
- 13. B 53. d -northeast
- 14. C 54. 150 m/km
- 15. B 55. B watershed
- 16. A 56. A
- 17. A 57. delta
- 18. D 58. Allow 1 credit for any value from 0.0008 cm to 0.001 cm.
- 19. C 59. C
- 20. A 60. Allow 1 credit for any value from 48 m/km to 52 m/km.
- 21. A 61. **Solution:** a) Based on the description, this will be uniform flow. Assume that the flow is turbulent in order to be able to use equation (1), the Manning equation. All of the parameters on the right side of equation (1) are known or can be calculated: From Table 1, $n = 0.011$. The bottom slope is given as: $S = 0.003$. From the diagram, it can be seen that the cross-sectional area perpendicular to flow is 1.5 ft times 4 ft = 6 ft². Also from the figure, it can be seen that the wetted perimeter is 1.5 + 1.5 + 4 ft = 7 ft. The hydraulic radius can now be calculated:
$$R_h = A/P = 6 \text{ ft}^2/7 \text{ ft} = 0.8571 \text{ ft}$$
- 22. C
- 23. D
- 24. A
- 25. A
- 26. C
- 27. C
- 28. C
- 29. C
- 30. A
- 31. D
- 32. A
- 33. A
- 34. C
- 35. C
- 36. B
- 37. C
- 38. C
- 39. A
- 40. D
- 41. A
- 42. B

$$Q = (1.49/0.011)(6)(0.8571^{2/3})(0.003^{1/2}) = \underline{40.2 \text{ ft}^3/\text{sec} = Q}$$

- 62. D
- 63. F
- 64. A
- 65. G
- 66. E
- 67. B
- 68. I
- 69. A. 2 B. 2 C. 5
- 70. D. 4 E. 3