Distances and dimensions

VOCABULARY PRACTICE

ADVANCED | C1

Name: _____ **Date:** _____

1 Match each advanced dimensional concept with its meaning.

1 dimensionality	____	a shortest path along a curved surface
2 Euclidean distance	____	b degree to which detail can be distinguished spatially
3 geodesic distance	____	c mathematical set equipped with a rule for distance
4 spatial resolution	____	d dependence of a property on direction
5 dimensional analysis	____	e expression of quantities through fundamental dimensions
6 scale invariance	____	f number of independent coordinates needed to describe a system
7 anisotropy	____	g range within which a measured value may plausibly lie
8 metric space	____	h straight-line distance in ordinary flat space
9 coordinate transformation	____	i conversion between different coordinate systems
10 measurement uncertainty	____	j preservation of structure across changes of scale

2 Complete the advanced dimensional collocations.

analysis | distance | invariance | resolution | space | transformation | uncertainty | units

1 dimensional _____

2 Euclidean _____

3 a metric _____

4 coordinate _____

5 scale _____

6 high spatial _____

7 quantify measurement _____

8 consistent physical _____

3 Choose the concept that best captures the distinction.

1 Shortest route across a sphere: *geodesic / Euclidean distance*.

2 Straight line on a flat plane: *Euclidean / geodesic distance*.

3 A material behaves differently by direction: *anisotropy / invariance*.

4 A sharper image distinguishes smaller features: *spatial resolution / dimensionality*.

5 A formula is checked through its units: *dimensional analysis / metric space*.

6 Coordinates are converted from one system to another: *transformation / uncertainty*.

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4 Complete the dimensional analysis with terms from the box.

anisotropy | coordinate transformation | dimensional analysis | dimensionality | Euclidean distance | geodesic distance | measurement uncertainty | metric space | scale invariance | spatial resolution

A system's **1** _____ is the number of independent coordinates required to describe it. In flat geometry, separation may be measured by **2** _____, while on a curved surface **3** _____ follows the shortest permitted path. A **4** _____ formalises how distances are defined. Data from different frames require a **5** _____. Image detail depends on **6** _____. Equations can be checked by **7** _____, but reported values still carry **8** _____. Direction-dependent behaviour is **9** _____, whereas preserved patterns across size changes show **10** _____.

5 Read the text and answer the questions concisely.

Measuring a curved world

On a small map, Earth may be treated as flat with little practical error. Over continental distances, however, curvature matters. The shortest route between two points on a sphere follows a great-circle path, not a straight line drawn on a rectangular map. Map projections convert the curved surface to a plane but inevitably distort distance, area, direction or shape. The best projection therefore depends on which property the application must preserve.

1 When may Earth be treated as flat? _____

2 When does curvature matter? _____

3 What path is shortest on a sphere? _____

4 What do map projections do? _____

5 Which properties may be distorted? _____

6 What determines the best projection? _____

6 Paraphrase using the expression in capitals.

1 The result may vary within a stated range. **UNCERTAINTY** _

2 The image reveals very small details. **RESOLUTION** _____

3 The property changes with direction. **ANISOTROPIC** _____

4 The pattern remains similar at different sizes. **INVARIANT** _

OVER TO YOU

Write a **160-190 word** discussion of how scale, curvature or measurement uncertainty affects a spatial model.

[ ] Use at least ten target terms or collocations. [ ] Distinguish model from measured space. [ ] Evaluate limitations precisely.

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ANSWER KEY

1 Advanced dimensional concepts

1 **f** 2 **h** 3 **a** 4 **b** 5 **e** 6 **j** 7 **d** 8 **c** 9 **i** 10 **g**

2 Advanced dimensional collocations

1 **analysis** 2 **distance** 3 **space** 4 **transformation** 5 **invariance** 6 **resolution** 7 **uncertainty** 8 **units**

3 Conceptual distinctions

1 **geodesic distance** 2 **Euclidean distance** 3 **anisotropy**
4 **spatial resolution** 5 **dimensional analysis** 6 **coordinate transformation**

4 Dimensional analysis

1 **dimensionality** 2 **Euclidean distance** 3 **geodesic distance** 4 **metric space** 5 **coordinate transformation**
6 **spatial resolution** 7 **dimensional analysis** 8 **measurement uncertainty** 9 **anisotropy** 10 **scale invariance**

5 Reading - suggested answers

1 On a small map. 2 Over continental distances. 3 A great-circle path. 4 Convert a curved surface to a plane.
5 Distance, area, direction or shape. 6 The property the application must preserve.

6 Paraphrasing - possible answers

1 The result has measurement **uncertainty**. 2 The image has high spatial **resolution**. 3 The property is **anisotropic**. 4 The pattern is scale **invariant**.

Over to you: Answers will vary. Check spatial modelling, scale, geometry and uncertainty.