Ratio, rates and similarity - applications paper

Name: _____ Date: _____

16 questions | 43 marks | 60 minutes

Apply proportional reasoning to routes, shadows, design decisions and the limits of models.

A scientific calculator may be used.

1. A bakery uses 450 g of flour for six rolls. Find the amount per roll. [1 mark]

2. Using the same recipe, how much flour is needed for 14 rolls? [2 marks]

3. A portable battery supplies 18 Wh each hour at a steady load. Write the energy-use rule in terms of hours t. [2 marks]

4. A cyclist averages 6 m/s. Express the speed in km/h. [2 marks]

5. A designer uses $1:40$ for a 3.2 m bench. Find its length on the plan. [2 marks]

6. A trail map uses $1:50\,000$. A planned route measures 13.6 cm. Find the walking distance. [2 marks]

7. A walker covers that 6.8 km route at 4 km/h without stops. Find the time in hours and minutes. [3 marks]

8. A 2 m vertical pole casts a 1.6 m shadow. At the same time a tower casts a 14.4 m shadow on level ground. Find its height. [3 marks]

9. A photo 12 cm wide is enlarged to 30 cm wide without distortion. Its original height is 8 cm. Find the new height. [2 marks]

10. A learner resizes a photo originally 12 cm wide and 8 cm high to 30 cm wide and 18 cm high. Explain whether this preserves the original shape. [3 marks]

11. Enlarge a layout point $P(5,3)$ by factor 2 about $C(2,1)$. Find the image. [3 marks]

12. A catering quote is 180 dollars for 10 people and 300 dollars for 20 people. Explain why a directly proportional model is unsuitable. [3 marks]

13. Those quotes fit $C=60+12n$. Predict the cost for 25 people and identify the fixed charge. [3 marks]

14. One cleaning solution covers 8 m² per litre. A room has 46 m² to clean. Bottles contain 2 L. How many bottles must be bought? [4 marks]

15. A model predicts a tank fills at 15 L/min for 12 minutes. The tank capacity is 150 L and it starts empty. Explain why the prediction needs a restriction. [4 marks]

16. A builder draws a 4.5 m fence as a 9 cm line. A printer then enlarges every drawing length by a factor of 1.25. [4 marks]

(a) Find the final scale. [2 marks]

(b) Find the final drawing length for a 3 m gate. [2 marks]