0 English for special purposes 1403/03/08

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1 An 80-gram paper, is a paper for which the mass of $(1\,\mathrm{m}^2)$ is $(80\,\mathrm{g})$. The surface area of an A_n paper is half the surface area of an A_{n-1} paper. The surface area of an A_0 paper is $(1\,\mathrm{m}^2)$. What is the mass of an A_4 paper of the type 80-gram?

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2 A yard is 0.9 meter. A yard is also 3 feet, and a foot is 12 inches. A mile is 5280 feet. How many meters is one mile?

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3 The perimeter of the earth's equator is $(40 \times 10^3\,\mathrm{k\,m})$. The distance between A and B on the earth is $(5 \times 10^3\,\mathrm{k\,m})$. This is the length of the shortest curve on the earth's surface, which connects these two points. What is the angle AOB? O is the center of the earth.

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4 The eccentricity e of an ellipse is the ratio of the distance between the two focal points of the ellipse, to the length of the major axis of the ellipse. For a point on the ellipse, the distance to one of the focal points varies between a minimum value which is half the difference of the length of the major axis and the distance between the focal points, and a maximum value which is half the sum of the length of the major axis and the distance between the focal points. What is the ratio of this minimum to this maximum, in terms of e?

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5 The time t needed that the temperatures of two points become nearly equal, is a function of their distance x. Assuming that heat is transferred by conduction, the other relevant quantities are c (the heat capacity per volume), and k (the heat conductivity). c is heat per (volume times temperature change), and k is heat per (time times surface area times T'), where T' is the derivative of the temperature with respect to the position. Using these, and a dimensional analysis, one arrives at the result that t is proportional to x^α. What is the value of α?

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6 Good luck

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Please write the answers in boxes and return only the answer sheet.

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1 $5\,\mathrm{g}$

2 1600

3 45°

4 $\dfrac{1-e}{1+e}$

5 2