

## PART B

The questions in this part of the assignment concern some mathematical ideas introduced in Units 1 and 2.

**Q5** [Gradient of a straight-line graph] Figure 2 is a straight-line graph based on a recipe for a cake. It shows how the time required to bake the cake (measured in minutes) varies with the mass of the cake (measured in pounds). Measure the gradient of this graph and choose the option from the key that is closest to your answer. Pencil across one cell in row 5.

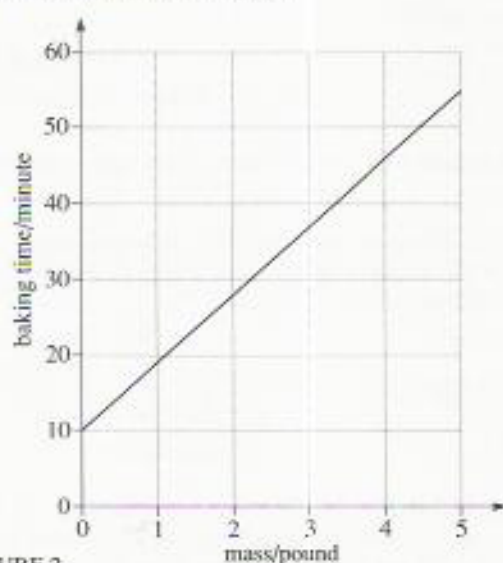


FIGURE 2

KEY for Q5

- |  |                        |
|--|------------------------|
| A 5 minutes per pound                                  | E 13 minutes per pound |
| B 7 minutes per pound                                  | F 15 minutes per pound |
| <input checked="" type="radio"/> C 9 minutes per pound | G 17 minutes per pound |
| D 11 minutes per pound                                 | H 19 minutes per pound |

**Q6** [Gradient of a curved graph] Figure 3 shows how the height of a child (measured in inches) varies with age (measured in years). The gradient of this graph is a measure of the child's rate of growth. Measure the gradient of the graph when the child is 4.0 years old, and

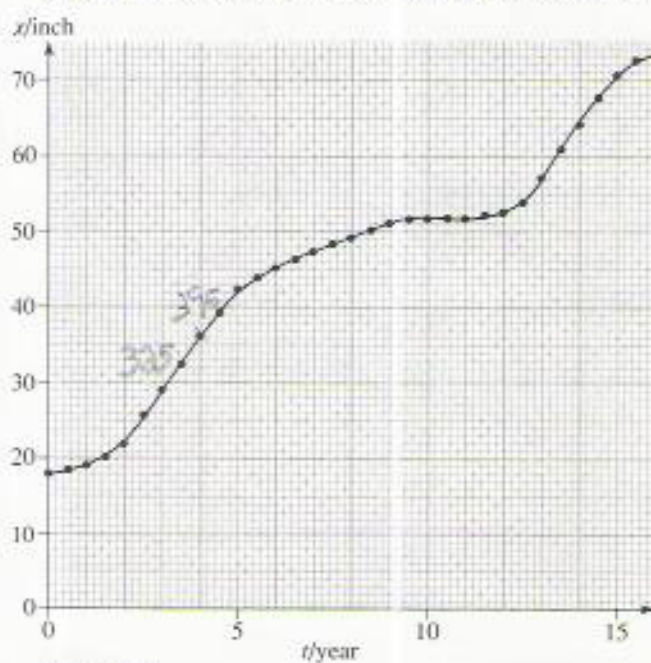


FIGURE 3

choose from the key the option that is closest to your answer. Pencil across one cell in row 6.

KEY for Q6

- |                       |                        |
|-----------------------|------------------------|
| A 1.1 inches per year | E 6.5 inches per year  |
| B 2.3 inches per year | F 8.1 inches per year  |
| C 3.4 inches per year | G 9.7 inches per year  |
| D 4.3 inches per year | H 12.1 inches per year |

**Q7** [Differentiation and graphs] Figure 4 is a graph of a quantity  $z$  plotted against another quantity  $y$ . The key for this question contains statements about this graph and the derivative  $dz/dy$ ; two of these statements are true and the other four are false. You are asked to select the two correct statements. Pencil across two cells in row 7.

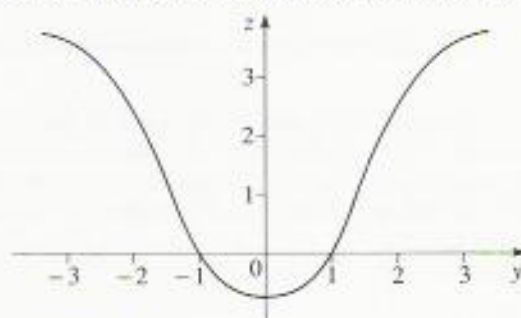


FIGURE 4

KEY for Q7

- |   |
|---|
| A $dz/dy$ is equal to zero at $y = 1$ .   |
| B $dz/dy$ is equal to zero at $y = -1$ .  |
| C $dz/dy$ is positive between $y = 0.1$ and $y = 3$ .   |
| D Since the graph is symmetrical on either side of the origin, $dz/dy$ has the same value for $y = 2$ as for $y = -2$ . |
| E The units of $dz/dy$ are the same as those of $z/y$ .   |
| F The value of $dz/dy$ depends on the scaling of the graph used to plot the graph.                                      |

**Q8** [Applying the rules of differentiation] The variable  $z$  is related to the variable  $y$  by the equation  $z = 3 + 2y^3$ . Calculate the derivative  $dz/dy$  at the point  $y = 2$ . Use your answer to determine the gradient of a graph of  $z$  against  $y$  at the point  $y = 2$ , and choose an option from the key that corresponds to this gradient. Pencil across one cell in row 8.

KEY for Q8

- |      |      |
|------|------|
| A 8  | E 19 |
| B 11 | F 24 |
| C 12 | G 27 |
| D 15 | H 48 |

**Q9** [Combining vectors] Given two displacement vectors  $a = (6 \text{ m}, -1 \text{ m})$  and  $b = (1 \text{ m}, -2 \text{ m})$ , calculate the magnitude of the displacement vector  $a - 2b$  and choose the option from the key that is closest to your answer. Pencil across one cell in row 9.

KEY for Q9

- |       |        |
|-------|--------|
| A 5 m | E 10 m |
| B 6 m | F 11 m |
| C 7 m | G 25 m |
| D 8 m | H 34 m |