Linear Modelling: exam practice

10 questions · 28 marks · worked solutions and markschemes

Name _____ Date _____ Score / 28

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/hlai/linear-modelling-exam-practice

1. **3 marks · Paper 1 style · calculator allowed**

A plumber charges a call-out fee plus an hourly rate. A 2-hour job costs $\$130$ and a 5-hour job costs $\$265$.

Find the hourly rate and the call-out fee. **[3]**

2. **3 marks · Paper 1 style · calculator allowed**

The line L has equation $4x - 3y = 24$.

Find its gradient and intercepts. **[3]**

3. **2 marks · Paper 1 style · calculator allowed**

The lines $3x + ky = 6$ and $2x - 5y = 1$ are perpendicular.

Find k. **[2]**

4. **2 marks · Paper 1 style · calculator allowed**

$A(-1, 2)$ and $B(5, 6)$.

Find the equation of the line through the midpoint of AB parallel to $y = 3x$. **[2]**

5. **3 marks · Paper 1 style · calculator allowed**

Line L_1 passes through $(0, 4)$ and $(6, 1)$. Line L_2 is perpendicular to L_1 and passes through $(2, -3)$.

Find the equation of L_2. **[3]**

6. **3 marks · Paper 1 style · calculator allowed**

A candle is 25 cm tall and burns at 1.5 cm per hour.

Write a linear model for the height and find when it burns out. **[3]**

7. **3 marks · Paper 2 style · calculator allowed**

Company A charges $\$50$ plus $\$0.30$ per km to hire a van. Company B charges $\$0.55$ per km.

Find the distance for which the costs are equal, and which is cheaper for 300 km. **[3]**

8. **3 marks · Paper 2 style · calculator allowed**

A water tank holds 800 litres and is drained at a constant rate. After 12 minutes it holds 560 litres.

Find a model for the volume and the time to empty. **[3]**

9. **3 marks · Paper 1 style · calculator allowed**

Find the point where the line through $(1, 1)$ with gradient 2 meets the line through $(0, 9)$ with gradient -1.

Find the point. **[3]**

10. **3 marks · Paper 2 style · calculator allowed**

A spring's length is $L = 0.4m + 12$ cm when a mass of m grams hangs from it.

Interpret the gradient and intercept, and find the mass that gives a length of 30 cm. **[3]**

Answers and worked solutions

Question 1 — 3 marks

Answer: $\$45$ per hour, $\$40$ fee

$\dfrac{265-130}{3}$ **M1**

$\$45$ per hour **A1**

$\$40$ fee **A1**

Question 2 — 3 marks

Answer: $\dfrac{4}{3}$; $(6,0)$, $(0,-8)$

gradient $\dfrac{4}{3}$ **A1**

$(6,0)$ **A1**

$(0,-8)$ **A1**

Question 3 — 2 marks

Answer: $\frac{6}{5}$

$-\dfrac{3}{k}\times\dfrac{2}{5}=-1$ **M1**

$k=\dfrac{6}{5}$ **A1**

Question 4 — 2 marks

Answer: $y=3x-2$

midpoint $(2,4)$ **A1**

$y=3x-2$ **A1**

Question 5 — 3 marks

Answer: $y=2x-7$

gradient $L_1=-\dfrac{1}{2}$ **A1**

gradient $L_2=2$ **A1**

$y=2x-7$ **A1**

Question 6 — 3 marks

Answer: $16\frac{2}{3}$ hours

$h=25-1.5t$ **A1**

$25-1.5t=0$ **M1**

$t=16\frac{2}{3}$ hours **A1**

Question 7 — 3 marks

Answer: 200 km; Company A

$50+0.3d=0.55d$ **M1**

$d=200$ km **A1**

Company A **A1**

Question 8 — 3 marks

Answer: $V=800-20t$; 40 minutes

rate 20 litres/min **A1**

$V=800-20t$ **A1**

40 min **A1**

Question 9 — 3 marks

Answer: $\left(\dfrac{10}{3},\dfrac{17}{3}\right)$

$y=2x-1$, $y=-x+9$ **A1**

$3x=10$ **M1**

$\left(\dfrac{10}{3},\dfrac{17}{3}\right)$ **A1**

Question 10 — 3 marks

Answer: $45\ g$

0.4 cm extension per gram **A1**

12 cm natural length **A1**

$m=45\ g$ **A1**

Every solution is also on ibmathrevision.com/hlai/linear-modelling-exam-practice

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