FOUNDATION & HIGHER

SAME AT BOTH TIERS

Name ..... Class .....

# A2: Substitution

*Solve problems by substituting into formulae*

20 marks · 25 minutes · Non-calculator

**1)** Kinetic energy is $E = \frac{1}{2}mv^2$. A car of mass 1200 kg speeds up from 10 m/s to 20 m/s. By how much does its kinetic energy increase?

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**[Question 1: 3 marks]**

**2)** A taxi costs $C = 3 + 1.6d$ pounds for $d$ miles. Amy has £20. What is the greatest whole number of miles she can travel?

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**[Question 2: 3 marks]**

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**3)** An object falls from rest. The distance fallen is $s = 5t^2$ metres after $t$ seconds. How long does it take to fall 125 m?

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**[Question 3: 3 marks]**

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**4)** $F = \frac{9C}{5} + 32$ converts degrees Celsius to Fahrenheit. At what temperature is $F$ equal to $C$?

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**[Question 4: 3 marks]**

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**5)** A trapezium has area $A = \frac{1}{2}(a + b)h$. $A = 30$, $a = 4$ and $h = 5$. Find $b$.

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**[Question 5: 2 marks]**

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**6)** A stall's profit is $P = 12n - 200$ pounds for $n$ items sold. How many items must be sold to make £400 profit?

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**[Question 6: 2 marks]**

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**7)** A chicken takes $T = 15 + 4w$ minutes to cook, where $w$ is its mass in kg. A 2.5 kg chicken must be ready at 6:00 pm. At what time must it start cooking?

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**[Question 7: 2 marks]**

**8)** Work out $a^2 - b^2$ and $(a - b)(a + b)$ when $a = 7$ and $b = -3$

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**[Question 8: 2 marks]**

**End of paper – 20 marks in total**

# Answers and brief mark scheme

| Q | Answer | Method / notes |
|---|---|---|
| 1 | 180 000 | 60 000 and 240 000 (P1, P1); A1. |
| 2 | 10 | $3 + 1.6d \leqslant 20$ (P1); $d \leqslant 10.6$ (P1); 10 (A1). |
| 3 | 5 | $5t^2 = 125$ (P1); $t^2 = 25$ (P1); A1. |
| 4 | −40 | $C = \frac{9C}{5} + 32$ (P1); $-\frac{4C}{5} = 32$ (P1); A1. |
| 5 | 8 | $30 = 2.5(4 + b)$ (P1); A1. |
| 6 | 50 | $12n = 600$ (P1); A1. |
| 7 | 5:35 pm | $T = 25$ minutes (P1); A1. |
| 8 | 40 and 40 | Both evaluated (P1); 40 (A1). |