Test answers - Straight-line graphs

Year: Year 10 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. $\frac{16-4}{5-1}=\frac{12}{4}=$ **3** (1 for the method, 1 for the answer) Divide the change in y by the change in x. The gradient is 3.

b. $y=3x+c$, $4=3+c$, $c=1$: $y=3x+1$ (1, 1) Substitute the point $(1,4)$ to find c. Check with $(5,16)$: $3\times5+1=16$. The equation is $y=3x+1$.

A common error in (a) is to divide the change in x by the change in y, giving $\frac{1}{3}$. Another is to subtract the coordinates in a different order on the top and the bottom. Here both changes are positive, so the line slopes upwards.

Answer to Question 2 (4 marks)

a. $3\times4-2=10$, **yes** (1) Substitute $x=4$: the equation gives $y=10$, so the point lies on the line.

b. $y=3x+5$ (1) A parallel line has the same gradient, 3, and the point $(0,5)$ gives the intercept 5.

c. $0=3x-2$ (1), $x=\frac{2}{3}$: $\left(\frac{2}{3},0\right)$ (1) Every point on the x-axis has $y=0$. Solve $3x-2=0$.

In (b), any line $y=3x+c$ is parallel, but only $c=5$ passes through $(0,5)$. In (c), the answer as a decimal, 0.67, is not exact, so the fraction is better.

Answer to Question 3 (4 marks)

a. $\left(\frac{-2+6}{2},\frac{1+7}{2}\right)=(2,4)$ (1, 1) The midpoint is the mean of the x values and the mean of the y values. The midpoint is $(2,4)$.

b. $\sqrt{8^2+6^2}=\sqrt{100}=$ **10** (1, 1) The changes are 8 across and 6 up, so we use Pythagoras. The length of AB is 10 units.

In (a), take care with the negative: $-2+6=4$. In (b), the horizontal change is $6-(-2)=8$, not 4, and the vertical change is $7-1=6$.

Answer to Question 4 (4 marks)

a. $\frac{93-48}{500-200}=\frac{45}{300}=$ **£0.15 per unit** (1, 1) The gradient is the change in the bill

divided by the change in units. Each unit costs 15p.

b. $48 - 0.15 \times 200 = 48 - 30 =$ **£18** (1) Subtract the cost of 200 units from the £48 bill. The standing charge is the intercept, £18.

c. $18 + 0.15 \times 350 = 18 + 52.50 =$ **£70.50** (1) Use $C = 18 + 0.15u$ with $u = 350$. The bill is £70.50.

Check (c): 350 units is halfway between 200 and 500, and the bill £70.50 is halfway between £48 and £93.

Answer to Question 5 (4 marks)

a. **−2** (1) The gradient of L is $\frac{1}{2}$. The perpendicular gradient is the negative reciprocal, -2, because $\frac{1}{2} \times (-2) = -1$.

b. $y = -2x + c$ (1), $7 = -4 + c$ (1), $c = 11$: $y = -2x + 11$ (1) Substitute the point $(2, 7)$ to find c. Check: $-2 \times 2 + 11 = 7$. The equation is $y = -2x + 11$.

In (b), a common error is to use the gradient $-\frac{1}{2}$ or 2 instead of the negative reciprocal. The new line crosses the y-axis at $(0, 11)$. Check that the gradients multiply to -1: $\frac{1}{2} \times (-2) = -1$, so the two lines meet at right angles.