HIGHER

2.5 Direct and Inverse Proportion With Non-Linear Powers: 1-hour Pack

Total Marks

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer all questions. Full sentences are required in 2 questions (where an explanation is asked). Allow 60 minutes.

1 W is directly proportional to the square root of L.
L is increased by 125%.
Work out the percentage change in W. State whether it is an increase or a decrease.

(Total for Question 1 is 4 marks)

2 W is inversely proportional to the cube of h. When h = 5, W = 384.
Find the positive value of h when W = 750.

(Total for Question 2 is 4 marks)

3 A is directly proportional to the square root of r. When r = 49, A = 28.
Find the value of A when r = 16.

(Total for Question 3 is 4 marks)

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4 I is inversely proportional to the cube of d. When d = 1, I = 4.
Find a formula for I in terms of d.

(Total for Question 4 is 3 marks)

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5 y is directly proportional to the square of h.
h is increased by 10%.
Work out the percentage change in y. State whether it is an increase or a decrease.

(Total for Question 5 is 4 marks)

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6 The time, t seconds, an object takes to fall from rest is directly proportional to the square root of the height, h metres, it falls. It takes 7 seconds to fall 4 m.
Find the time it takes to fall 16 m.

(Total for Question 6 is 4 marks)

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7 W is inversely proportional to the square root of h. When h = 25, W = 36.
Find the positive value of h when W = 20.

(Total for Question 7 is 4 marks)

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8 y is directly proportional to the square of x. When x = 3, y = 18.
Find a formula for y in terms of x.

(Total for Question 8 is 3 marks)

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9 The power P is directly proportional to the square of the voltage V and inversely proportional to the resistance R.
When V = 2 and R = 5, P = 40.
Find the value of P when V = 4 and R = 2.

(Total for Question 9 is 5 marks)

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10 W is directly proportional to the cube of L.
L is decreased by 40%.
Work out the percentage change in W. State whether it is an increase or a decrease.

(Total for Question 10 is 4 marks)

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11 E is inversely proportional to the square of v. When v = 4, E = 54.
Find the positive value of v when E = 96.

(Total for Question 11 is 4 marks)

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Mark scheme · 2.5 Direct and Inverse Proportion With Non-Linear Powers: 1-hour Pack

Question 1

$W = k\sqrt{L}$ and the multiplier for L is 2.25	**M1**
applies the same power or root to the multiplier, giving a W multiplier of 3/2	**M1**
W multiplier = 1.5	**A1**
50% increase	**A1**

Answer: 50% increase

Question 2

writes $W = k/h^3$ and substitutes to find k	**M1**
k = 48000	**A1**
substitutes W = 750 into $W = 48000/h^3$ and rearranges for h	**M1**
h = 4 cao	**A1**

Answer: h = 4

Question 3

writes the relationship as $A = k\sqrt{r}$	**M1**
substitutes r = 49, A = 28 to find k	**M1**
k = 4, so $A = 4\sqrt{r}$	**A1**
A = 16 when r = 16	**A1**

Answer: A = 16

Question 4

$I = k/d^3$	**M1**
substitutes d = 1, I = 4 and solves for k	**M1**
$I = 4/d^3$	**A1**

Answer: $I = 4/d^3$

Question 5

$y = kh^2$ and the multiplier for h is 1.1	**M1**
applies the same power or root to the multiplier, giving a y multiplier of 121/100	**M1**
y multiplier = 1.21	**A1**
21% increase	**A1**

Answer: 21% increase

Question 6

$t = k\sqrt{h}$	**M1**
$k = 7/\sqrt{4} = 7/2$	**M1**
$t = 7/2 \times \sqrt{16}$	**M1**
t = 14 seconds	**A1**

Answer: t = 14 seconds

Question 7

writes $W = k/\sqrt{h}$ and substitutes to find k	**M1**
k = 180	**A1**
substitutes W = 20 into $W = 180/\sqrt{h}$ and rearranges for h	**M1**
h = 81 cao	**A1**

Answer: h = 81

Question 8

$y = kx^2$	**M1**
substitutes x = 3, y = 18 and solves for k	**M1**
$y = 2x^2$	**A1**

Answer: $y = 2x^2$

Question 9

$P = kV^2/R$	**M1**
substitutes to get 40 = k x 4/5	**M1**
k = 50	**A1**
P = 50 x 16/2	**M1**
P = 400	**A1**

Answer: P = 400

Question 10

$W = kL^3$ and the multiplier for L is 0.6	**M1**
applies the same power or root to the multiplier, giving a W multiplier of 27/125	**M1**
W multiplier = 0.216	**A1**
78.4% decrease	**A1**

Answer: 78.4% decrease

Question 11

writes $E = k/v^2$ and substitutes to find k	**M1**
k = 864	**A1**
substitutes E = 96 into $E = 864/v^2$ and rearranges for v	**M1**
v = 3 cao	**A1**

Answer: v = 3

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