2.8 Direct and Inverse Proportion: Test Pack

AQA 8365 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Which of the following equations shows y directly proportional to x?

- ☐ A) $y = x + 5$
- ☐ B) $y = 3x$
- ☐ C) $y = 5/x$
- ☐ D) $y = x^2$

(Total for Question 1 is 1 mark)

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2 y is directly proportional to the square of x. When x = 8, y = 1280. Find a formula for y in terms of x.

(Total for Question 2 is 3 marks)

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3 A table shows corresponding values of x and y. It is given that y is proportional to x^3.

x: 5, 13, 6

y: 2375, 41743, p

Work out the value of p.

(Total for Question 3 is 3 marks)

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4 y is directly proportional to the cube of x. x is increased by 50%. Work out the percentage change in y. State whether it is an increase or a decrease.

(Total for Question 4 is 3 marks)

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5 y is directly proportional to x. When x = 6, y = 21. Find the value of y when x = 10.

(Total for Question 5 is 2 marks)

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6 A table shows corresponding values of x and y. It is given that y is proportional to x^3.

x: 2, 15, 9

y: 80, 33750, p

Work out the value of p.

(Total for Question 6 is 3 marks)

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7 y is inversely proportional to the square of x. When x = 4, y = 15. Find the value of y when x = 2.

(Total for Question 7 is 3 marks)

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8 y is inversely proportional to x. When x = 2, y = 36. Find a formula for y in terms of x.

(Total for Question 8 is 3 marks)

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9 y is directly proportional to the square of x and inversely proportional to z. When x = 5 and z = 3, y = 50. Find the value of y when x = 5 and z = 2.

(Total for Question 9 is 4 marks)

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10 y is directly proportional to the square of x. When x = 10, y = 1000. Find the value of y when x = 11.

(Total for Question 10 is 3 marks)

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11 A table shows corresponding values of x and y. It is given that y is proportional to x^2.

x: 4, 10, 8

y: 304, 1900, p

Work out the value of p.

(Total for Question 11 is 3 marks)

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12 Which of the following equations shows p inversely proportional to q?

- ☐ A) $p = 7q$
- ☐ B) $p = 7/q$
- ☐ C) $p = q + 7$
- ☐ D) $p = q^2/7$

(Total for Question 12 is 1 mark)

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13 y is directly proportional to x. Given that y = 20 when x = 4, state the value of the constant of proportionality k.

(Total for Question 13 is 1 mark)

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14 p is directly proportional to q^2. When q = 4, p = 32. Find the value of p when q = 7.

(Total for Question 14 is 3 marks)

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15 y is directly proportional to x. When x = 9, y = 54. Find the value of y when x = 13.

(Total for Question 15 is 2 marks)

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16 y is directly proportional to x^2. Find the percentage increase in y when x is increased by 20%.

(Total for Question 16 is 2 marks)

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17 p is inversely proportional to q^3. Show that if q is trebled, p is divided by 27.

(Total for Question 17 is 3 marks)

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18 y is directly proportional to x. When x = 3, y = 12. Find, in exact surd form, the values of x for which $y = x^2 - 7$.

(Total for Question 18 is 4 marks)

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19 y is directly proportional to x^2. When x = 3, y = 36. Separately, y is inversely proportional to w, and when x = 3 (so y = 36), it is also known that w = 6 at this point. Find the value of w when x = 6.

(Total for Question 19 is 3 marks)

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Mark scheme · 2.8 Direct and Inverse Proportion: Test Pack

Question 1

B cao **B1**

Answer: B) y = 3x

Question 2

$y = kx^2$ or equivalent **M1**

substitutes to find k = 20 **M1**

$y = 20x^2$ cao **A1**

Answer: $y = 20x^2$

Question 3

uses the given relationship with a constant k **M1**

finds k = 19 **M1**

p = 4104 cao **A1**

Answer: p = 4104

Question 4

new x = 3/2x, so y is multiplied by 3/2 to the power 3 **M1**

multiplier = 27/8 **M1**

y increases by 237.5% cao **A1**

Answer: y increases by 237.5%

Question 5

finds the constant of proportionality, k = 3.5 (from 21 = 6k) **M1**

y = 35 cao **A1**

Answer: y = 35

Question 6

uses the given relationship with a constant k **M1**

finds k = 10 **M1**

p = 7290 cao **A1**

Answer: p = 7290

Question 7

writes $y = k/x^2$ or equivalent **M1**

finds k = 240 **M1**

y = 60 cao **A1**

Answer: y = 60

Question 8

y = k/x or equivalent **M1**

substitutes to find k = 72 **M1**

y = 72/x cao **A1**

Answer: y = 72/x

Question 9

$y = kx^2/z$ or equivalent **M1**

substitutes to find k = 6 **M1**

substitutes the new values **M1**

y = 75 cao **A1**

Answer: y = 75

Question 10

writes $y = kx^2$ or equivalent **M1**

finds k = 10 **M1**

y = 1210 cao **A1**

Answer: y = 1210

Question 11

uses the given relationship with a constant k **M1**

finds k = 19 **M1**

p = 1216 cao **A1**

Answer: p = 1216

Question 12

B cao **B1**

Answer: B) p = 7/q

Question 13

5 cao **B1**

Answer: k = 5

Question 14

finds k = 2 (from $32 = k(4)^2$, i.e. 32 = 16k) **M1**

substitutes q = 7 into $p = 2q^2$ **M1**

p = 98 cao **A1**

Answer: p = 98

Question 15

finds the constant of proportionality, k = 6 (from 54 = 9k) **M1**

y = 78 cao **A1**

Answer: y = 78

Question 16

lets the original $y = kx^2$, and finds the new y when x is increased by 20%: $k(1.2x)^2 = 1.44kx^2 = 1.44y$ **M1**

44% cao **A1**

Answer: y increases by 44%

Question 17

lets the original $p = k/q^3$ **M1**

finds the new p when q is trebled: $k/(3q)^3 = k/(27q^3) = p/27$ **M1**

correct conclusion: p is divided by 27, as required **A1**

Answer: p is divided by 27 (shown)

Question 18

finds k = 4 (from 12 = 3k), so y = 4x **M1**

sets up $4x = x^2 - 7$ and rearranges to $x^2 - 4x - 7 = 0$ **M1**

applies the quadratic formula with a = 1, b = -4, c = -7, giving $x = (4 \pm \sqrt{16 + 28})/2$ **M1**

$x = 2 + \sqrt{11}$ or $x = 2 - \sqrt{11}$ cao (both values, exact surd form) **A1**

Answer: $x = 2 + \sqrt{11}$ or $x = 2 - \sqrt{11}$

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Question 19

finds the first constant, k1 = 4 (from $36 = k1(3)^2$), so $y = 4x^2$, and finds y at x = 6: $y = 4(6)^2 = 144$ **M1**

finds the second constant, k2 = 216 (from k2 = 36 x 6), so y = 216/w **M1**

w = 1.5 cao **A1**

Answer: w = 1.5

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