Higher Check In - 5.02 Direct and inverse proportion

1. Given that $y \propto x$, complete the table.

x	5	10		4.5	
y	12		96		32.4

2. y is directly proportional to x^2. When $x = 2$, $y = 10$.
   Formulate an equation to describe the relationship between x and y.

3. $y \propto \dfrac{1}{x}$. When $x = 40$, $y = 20$. Find y when $x = 100$.

4. $y \propto \sqrt{x}$. When $x = 100$, $y = 45$. Find x when $y = 99$.

5. y is inversely proportional to the cubed root of x. When $x = 64$, $y = 30$.
   Find y when $x = 125$.

6. The formula for the area of a circle is $A = \pi r^2$. Describe the type of proportion between the variables A and r.

7. Which of the following graphs does not illustrate a proportional relationship? Explain why.
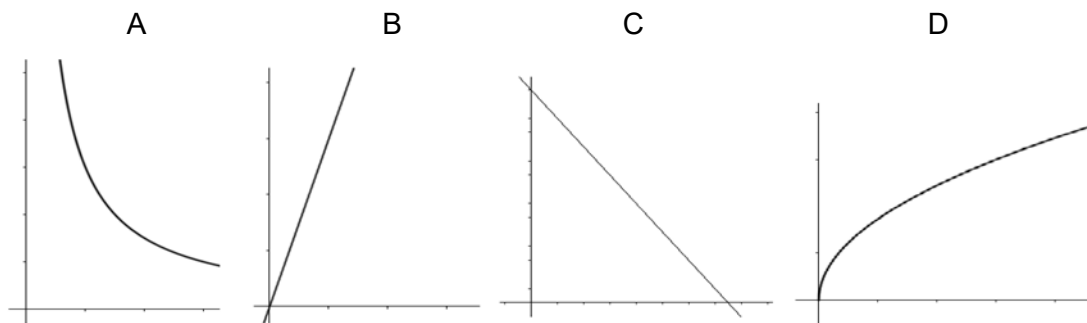
8. y is inversely proportional to the cube of x and when x is 1, y is 1000. Show that when x is 5, y will equal 8.

9. A ball is dropped from various heights. It is assumed that the time it takes for the ball to hit the ground is directly proportional to the square root of the vertical distance travelled. When the ball is dropped from 4 metres it takes 1 second to reach the ground. How long will it take when it is dropped from 100 metres?

10. Over a constant distance the speed of a bus, s, is inversely proportional to the travel time, t. By what percentage will the travel time change if the speed decreases by 20%?

Extension

What real life scenarios could graphs A and B in question 7 represent? Add labels to each of the axes and describe the relationship between the pairs of variables.

Answers

1.

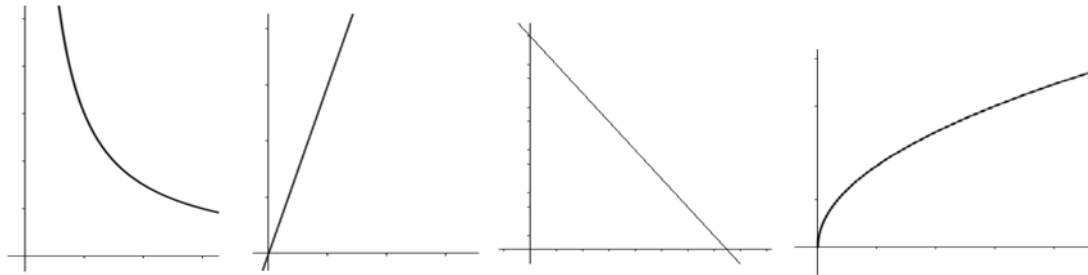| x	5	10	**40**	4.5	**13.5**
y	12	**24**	96	**10.8**	32.4

2. $y = \dfrac{5}{2}x^2$ oe

3. $y = 8$

4. $x = 484$

5. $y = 24$

6. A is directly proportional to the square of r.

7.   A $y \propto \dfrac{1}{x}$ B $y \propto x$ C is not proportional   D $y \propto \sqrt{x}$

C is a linear relationship, $y = c - mx$, but not directly proportional because it does not pass through (0, 0).

8. $y \propto \dfrac{1}{x^3}$, $y = \dfrac{k}{x^3}$, $1000 = \dfrac{k}{1^3}$, therefore $k = 1000$.

Substituting $x = 5$ into $y = \dfrac{1000}{x^3}$ gives $y = \dfrac{1000}{5^3} = \dfrac{1000}{125} = 8$.

9. 5 seconds

10. 25% increase in travel time

Extension

Possible solutions include:

A: Painting a wall: time on x and number of people on y.
       Travelling time: speed on x and time on y.

B: Wages earned: hours worked on x and money earned on y.
       The size of a circle: diameter on x and circumference on y.

There is an opportunity to discuss the dependent and independent variable in each pairing to determine which variable would be used as the x-axis.

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GCSE (9–1) MATHEMATICS

Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Calculate quantities in direct proportion			
AO1	2	Create an equation when a quantity is directly proportional to a square of another quantity			
AO1	3	Calculate inverse proportion			
AO1	4	Calculate direct proportion involving a root of another quantity			
AO1	5	Calculate inverse proportion involving a cubed root of another quantity			
AO2	6	Recognise proportionality and be able to describe it			
AO2	7	Recognise the graphs of proportionality and be able to describe them			
AO2	8	Formulate an equation and use correct mathematical communication			
AO3	9	Formulate and solve an equation involving a quantity in direct proportion to a root of another quantity			
AO3	10	Solve an inverse proportionality problem			

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