# Direct & Inverse Proportion

## Model Answers

## Question 1

y varies inversely as the square of x.
y = 1.5 when x = 8.

Find y when x = 5.

## Answer:

*First, we know that y varies inversely as the square of x. This can be written as y = k/(x^2), where k is the constant of variation.*

*Next, we can find the value of k using the given values of y and x. Substituting y = 1.5 and x = 8 into the equation, we get 1.5 = k/(8^2). Solving for k, we find that k = 1.5 * 64 = 96. Now that we know k, we can find y when x = 5. Substituting these values into the equation, we get y = 96/(5^2) = 96/25 = 3.84. So, when x = 5, y = 3.84.*

## Question 2

The braking distance, d, of a car is directly proportional to the square of its speed, v.
When d = 5, v = 10.

Find d when v = 70.



## Answer:

*First, we know that the braking distance is directly proportional to the square of its speed. This can be written as d = kv^2, where k is the constant of proportionality. We are given that when d = 5, v = 10. We can substitute these values into the equation to find k: 5 = k(10)^2 5 = k(100) k = 5/100 k = 0.05*

*Now we know the value of k, we can find d when v = 70. We substitute these values into the equation: d = 0.05(70)^2 d = 0.05(4900) d = 245 So, when v = 70, d = 245.*

## Question 3

A spray can is used to paint a wall.
The thickness of the paint on the wall is t. The distance of the spray can from the wall is d.
t is inversely proportional to the square of d.
t = 0.2 when d = 8.
Find t when d = 10.

# Answer:

*First, we know that t is inversely proportional to the square of d. This means that t * d^2 = k, where k is a constant. We can find the value of k using the given values of t and d. When t = 0.2 and d = 8, we get 0.2 * 8^2 = k. So, k = 12.8. Now, we can find t when d = 10. We know that t * 10^2 = 12.8. So, t = 12.8 / 100 = 0.128.*

*Therefore, when d = 10, t = 0.128.*



## Question 4

3 The quantity p varies inversely as the square of (q + 2).
p = 5 when q = 3.

Find p when q = 8.

# Answer:

*First, we know that p varies inversely as the square of (q + 2). This can be written as p = k / (q + 2)^2, where k is a constant.*

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## Question 5

M is proportional to the cube of r.
When r = 3, M = 21.6.

When r = 5, find the value of M.

## Answer:

*First, we know that M is proportional to the cube of r, which means M = kr^3 for some constant k. We can find the value of k when r = 3 and M = 21.6. Substituting these values into the equation gives us 21.6 = k(3^3) = 27k. Solving for k, we get k = 21.6 / 27 = 0.8. Now we can find the value of M when r = 5 by substituting these values into the equation.*

*This gives us M = 0.8(5^3) = 0.8 * 125 = 100. So when r = 5, M = 100.*

## Question 6

The quantity y varies as the cube of (x+ 2).
y = 32 when x = 0.

Find y when x = 1.



## Answer:

*First, we know that y varies as the cube of (x+2). This means that y = k* (x+2)^3 for some constant k. We are given that y = 32 when x = 0. We can use this information to find the value of k. Substituting these values into the equation gives us 32 = k*(0+2)^3 = 8k. Solving for k gives us k = 32/8 = 4.*

*Now that we know k = 4, we can find y when x = 1. Substituting these values into the equation gives us y = 4*(1+2)^3 = 4*27 = 108. So, y = 108 when x = 1.*

## Question 7

The force of attraction (F) between two objects is inversely proportional to the square of the distance
(d) between them.
When d = 4, F = 30.

Calculate F when d = 8.

## Answer:

*First, we know that the force of attraction (F) is inversely proportional to the square of the distance (d). This can be written as F = k/(d^2), where k is a constant. We are given that when d = 4, F = 30. We can substitute these values into the equation to find the constant k. So, 30 = k/(4^2) or 30 = k/16. Solving for k, we get k = 30 * 16 = 480.*

*Now we can use this value of k to find F when d = 8. Substituting these values into the equation, we get F = 480/(8^2) = 480/64 = 7.5. So, when d = 8, F = 7.5*

## Question 8

The air resistance (R) to a car is proportional to the square of its speed (v).
When R = 1800, v = 30.

Calculate R when v = 40.



## Answer:

*First, we know that air resistance is proportional to the square of the speed. This means that the ratio of R to v^2 is constant. We can write this as: R/v^2 = k where k is the constant of proportionality. We can find the value of k using the given values of R and v. When R = 1800 and v = 30, we have: 1800/30^2 = k 1800/900 = k*

*k = 2 Now we can use this value of k to find R when v = 40. We substitute these values into the equation: R = k * v^2 R = 2 * 40^2 R = 2 * 1600 R = 3200 So when v = 40, R = 3200.*

## Question 9

When cars go round a bend there is a force, F, between the tyres and the ground.
F varies directly as the square of the speed, v.
When v = 40, F = 18.

Find F when v = 32

## Answer:

*F = k * v^2*
*where k is a constant of proportionality. To find k, we can use the given information:*
*18 = k * 40^2*

*Solving for k, we get:*
*k = 18 / 1600 = 0.01125*

*Now that we have found k, we can use it to find F when v = 32:*
*F = k * 32^2 = 11.52*

*Therefore, when v = 32, the force between the tyres and the ground is approximately 11.52.*



## Question 10

$y$ is directly proportional to the positive square root of $x$.
When $x = 9$, $y = 12$.

Find $y$ when $x = \frac{1}{4}$.

## Answer:

*We can use the given information that when x=9, y=12 to find the value of \( k). Substituting these values into the equation gives us \( 12 = k \sqrt{9} \), which simplifies to \( 12 = 3k \). Solving for \( k \) gives us \( k = 4 \). Now that we know \( k = 4 \), we can find \( y \) when \( x=\frac{1}{4} \). Substituting these values into the equation gives us \( y = 4 \sqrt{\frac{1}{4}} \), which simplifies to \( y = 4 \times \frac{1}{2} = 2 \). So, \( y = 2 \) when \( x=\frac{1}{4} \).*

## Question 11

V is directly proportional to the cube of (r + 1).
When r = 1, V = 24.

Work out the value of V when r = 2

## Answer:

*First, we know that V is directly proportional to the cube of (r + 1). This can be written as V = k*(r + 1)^3, where k is the constant of proportionality. We are given that when r = 1, V = 24. We can substitute these values into the equation to find the value of k. 24 = k*(1 + 1)^3 24 = k*2^3 24 = k*8 k = 24/8 k = 3*

*Now that we know k = 3, we can find the value of V when r = 2. V = 3*(2 + 1)^3 V = 3*3^3 V = 3*27 V = 81 So, when r = 2, V = 81.*

## Question 12

y is directly proportional to the square of (x − 1).
y = 63 when x = 4.

Find the value of y when x = 6.



## Answer:

*First, we know that y is directly proportional to the square of (x - 1). This can be written as y = k(x - 1)^2, where k is the constant of proportionality. We are given that y = 63 when x = 4. We can substitute these values into the equation to find k: 63 = k(4 - 1)^2 63 = k(3)^2 63 = 9k k = 63 / 9 k = 7*

*Now that we know k = 7, we can find the value of y when x = 6: y = 7(6 - 1)^2 y = 7(5)^2 y = 7 * 25 y = 175 So, when x = 6, y = 175.*

## Question 13

y is inversely proportional to $(x + 2)^2$.
When x = 1, y = 2.

Find y in terms of x.

# Answer:

*First, we know that y is inversely proportional to $(x + 2)^2$. This means that $y = k / (x + 2)^2$, where k is the constant of proportionality.*

*Next, we're given that when x = 1, y = 2. We can substitute these values into the equation to find k: $2 = k / (1 + 2)^2$ $2 = k / 9$ $k = 2 * 9$ $k = 18$ So, the equation is $y = 18 / (x + 2)^2$.*

## Question 14

p is inversely proportional to the square of (q + 4).
p = 2 when q = 2.
Find the value of p when q = –2.



# Answer:

*First, we know that p is inversely proportional to the square of (q + 4). This can be written as p = k/(q + 4)^2, where k is the constant of proportionality.*

*Next, we're given that p = 2 when q = 2. We can substitute these values into the equation to find k: 2 = k/(2 + 4)^2 = k/36. Solving for k gives us k = 72.*

*Finally, we're asked to find the value of p when q = -2. Substituting these values into the equation gives us p = 72/(-2 + 4)^2 = 72/4 = 18. So, the value of p when q = -2 is 18.*

## Question 15

The number of hot drinks sold in a café decreases as the weather becomes warmer.
What type of correlation does this statement show?

# Answer:

*Correlation is a statistical measure that describes the size and direction of a relationship between two or more variables. In this case, the two variables are the number of hot drinks sold and the weather temperature*

*The statement says that as the weather becomes warmer (one variable increases), the number of hot drinks sold decreases (the other variable decreases). This is an example of a negative correlation, because as one variable increases, the other decreases.*

## Question 16

x varies directly as the cube root of y.
x = 6 when y = 8.

Find the value of x when y = 64.



# Answer:

*First, we know that x varies directly as the cube root of y. This can be written as x = ky^(1/3), where k is the constant of variation.*

*Next, we're given that x = 6 when y = 8. We can substitute these values into the equation to find k: 6 = k*8^(1/3) 6 = 2k k = 3 Now that we know k, we can find x when y = 64: x = 3*64^(1/3) x = 3*4 x = 12 So, when y = 64, x = 12.*

## Question 17

y varies directly with $\sqrt{x+5}$.

$y = 4$ when $x = -1$.

Find $y$ when $x = 11$.

## Answer:

*First, we know that y varies directly with \( \sqrt{x+5} \), so we can write this relationship as \( y = k \sqrt{x+5} \), where k is the constant of variation.*

*Next, we can find the value of k using the given information that \( y=4 \) when \( x=-1 \). Substituting these values into the equation gives us \( 4 = k \sqrt{-1+5} \), which simplifies to \( 4 = 2k \). Solving for k gives us \( k = 2 \). Now that we know k, we can find \( y \) when \( x=11 \) by substituting these values into the equation: \( y = 2 \sqrt{11+5} \), which simplifies to \( y = 2 \sqrt{16} = 2*4 = 8 \). So, \( y = 8 \) when \( x = 11 \).*

## Question 18

The cost of a circular patio, $C, varies as the square of the radius, r metres.
C = 202.80 when r = 2.6 .

Calculate the cost of a circular patio with r = 1.8 .

## Answer:

*First, we know that the cost C is proportional to the square of the radius r. This can be written as C = kr^2, where k is the constant of proportionality. We can find the value of k using the given values of C and r. Substituting C = 202.80 and r = 2.6 into the equation, we get: 202.80 = k * (2.6)^2 202.80 = k * 6.76 k = 202.80 / 6.76 k = 30*

*Now that we have the value of k, we can calculate the cost of a circular patio with r = 1.8. Substituting k = 30 and r = 1.8 into the equation, we get: C = 30 * (1.8)^2 C = 30 * 3.24 C = 97.20 So, the cost of a circular patio with r = 1.8 is $97.20.*

## Question 19

y varies inversely as (x+5).
y = 6 when x = 3.
Find y when x = 7.

## Answer:

*First, we know that y varies inversely as (x+5). This means that the product of y and (x+5) is a constant. We can write this relationship as y = k/(x+5), where k is the constant.*

*Next, we're given that y = 6 when x = 3. We can substitute these values into the equation to find the constant k: 6 = k/(3+5) 6 = k/8 k = 6 * 8 k = 48 Now that we know k = 48, we can substitute this value back into the equation to find y when x = 7: y = 48/(7+5) y = 48/12 y = 4 So, when x = 7, y = 4.*

## Question 20

$w$ varies inversely as the square root of $x$.
When $x = 4$, $w = 4$.

Find $w$ when $x = 25$.



## Answer:

*First, we know that w varies inversely as the square root of x. This can be written as w = k / sqrt(x), where k is a constant. We can find the value of k using the given values of w and x. When w = 4 and x = 4, we can substitute these values into the equation to get 4 = k / sqrt(4). Solving for k gives us k = 4 * sqrt(4) = 8.*

*Now that we know k = 8, we can find w when x = 25. Substituting these values into the equation gives us w = 8 / sqrt(25) = 8 / 5 = 1.6. So, when x = 25, w = 1.6.*

## Question 21

y varies as the cube root of (x+3). When x = 5, y = 1.

Find the value of y when x = 340.

# Answer:

*First, we know that y varies as the cube root of (x+3). This can be written as y = k*(x+3)^(1/3), where k is a constant of variation. We are given that when x = 5, y = 1. We can substitute these values into the equation to find the value of k. 1 = k*(5+3)^(1/3) 1 = k*2 So, k = 1/2. Now we know the full equation: y = (1/2)*(x+3)^(1/3).*

*We are asked to find the value of y when x = 340. We substitute x = 340 into the equation: y = (1/2)*(340+3)^(1/3) y = (1/2)*343^(1/3) y = (1/2)*7 y = 3.5 So, when x = 340, y = 3.5.*



## Question 22

The speed, v, of a wave is inversely proportional to the square root of the depth, d, of the water.
v = 30 when d = 400.

Find v when d=25.

# Answer:

*First, we know that the speed of the wave is inversely proportional to the square root of the depth of the water. This can be written as v = k/sqrt(d), where k is a constant of proportionality. We are given that v = 30 when d = 400. We can substitute these values into the equation to find the constant of proportionality: 30 = k/sqrt(400) 30 = k/20 k = 30 * 20 k = 600*

*Now that we know the constant of proportionality, we can find the speed of the wave when the depth is 25: v = 600/sqrt(25) v = 600/5 v = 120 So, the speed of the wave when the depth is 25 is 120.*

## Question 23

m varies directly as the cube ofx. m = 200 when x = 2.

Find m when x = 0.4.

## Answer:

*First, we know that m varies directly as the cube of x. This means that m = kx^3, where k is the constant of variation. We are given that m = 200 when x = 2. We can substitute these values into the equation to find k: 200 = k(2)^3 200 = 8k k = 200 / 8 k = 25*

*Now that we know k, we can find m when x = 0.4: m = 25(0.4)^3 m = 25(0.064) m = 1.6 So, when x = 0.4, m = 1.6.*

## Question 24

y is inversely proportional to $x^3$.
y = 5 when x = 2.

Find y when x = 4.



## Answer:

*First, we know that y is inversely proportional to $x^3$, so we can write this relationship as y = k/($x^3$), where k is the constant of proportionality.*

*Next, we can find the value of k using the given values of y and x. We know that y = 5 when x = 2, so we can substitute these values into the equation to get 5 = k/($2^3$) or 5 = k/8. Solving for k, we get k = 5 * 8 = 40. Now that we know k = 40, we can find y when x = 4. Substituting these values into the equation, we get y = 40/($4^3$) = 40/64 = 0.625. So, when x = 4, y = 0.625.*

## Question 25

The mass, m, of a sphere varies directly with the cube of its radius, r. m = 160 when r=2.

Find m when r = 5.

# Answer:

*First, we know that the mass of the sphere is directly proportional to the cube of its radius. This can be written as m = kr^3, where k is the constant of proportionality. We are given that m = 160 when r = 2. We can substitute these values into the equation to find the value of k: 160 = k(2)^3 160 = 8k k = 160 / 8 k = 20*

*Now that we know the value of k, we can find the mass of the sphere when r = 5: m = 20(5)^3 m = 20 * 125 m = 2500 So, when the radius of the sphere is 5, its mass is 2500.*

## Question 26

The electrical resistance, R, of a length of cylindrical wire varies inversely as the square of the diameter, d, of the wire.
R = 10 when d=2.

Find R when d = 4.

# Answer:

*First, we know that the resistance R and the diameter d are inversely proportional, and their relationship can be expressed as R = k/(d^2), where k is a constant. We are given that R = 10 when d = 2. We can substitute these values into the equation to find the constant k: 10 = k/(2^2) 10 = k/4 k = 10 * 4 k = 40*

*Now we know that the constant k is 40, we can substitute this value and d = 4 into the equation to find the new resistance: R = 40/(4^2) R = 40/16 R = 2.5 So, when the diameter of the wire is 4, the resistance is 2.5.*

## Question 27

The mass, m, of an object varies directly as the cube of its length, /.
m = 250 when l= 5.
Find m when l = 7.

# Answer:

*First, we know that the mass of an object varies directly as the cube of its length. This can be written as m = kl^3, where k is the constant of variation. We are given that m = 250 when l = 5. We can substitute these values into the equation to find the constant of variation: 250 = k(5^3) 250 = k(125) k = 250/125 k = 2*

*Now that we know k = 2, we can find the mass when l = 7: m = 2(7^3) m = 2(343) m = 686 So, when l = 7, m = 686.*



## Question 28

y varies inversely as the square root of x. When x = 9, y = 6.
Find y when x = 36.

# Answer:

*First, we know that y varies inversely as the square root of x. This can be written as y = k/√x, where k is the constant of variation.*

*Next, we can find the value of k using the given values of x and y. When x = 9 and y = 6, we can substitute these values into the equation to get 6 = k/√9. Solving for k gives us k = 6 * √9 = 18. Now that we have the value of k, we can find y when x = 36. Substituting these values into the equation gives us y = 18/√36 = 18/6 = 3. So, when x = 36, y = 3.*

## Question 29

y is inversely proportional to $x^2$.
When x = 4, y=3.

Find y when x = 5.

### Answer:

*First, we know that y is inversely proportional to $x^2$, which means $y = k/x^2$, where k is the constant of proportionality. We can find the value of k by substituting the given values of x and y into the equation. When x = 4 and y = 3, we get $3 = k/4^2$, which simplifies to 3 = k/16. Solving for k, we get k = 3*16 = 48.*

*Now that we know k = 48, we can find y when x = 5 by substituting these values into the equation. We get $y = 48/5^2 = 48/25 = 1.92$. So, when x = 5, y = 1.92.*



## Question 30

y varies directly as the square of (x-3).
y= 16 when x = 1.

Find y when x = 10.

### Answer:

*First, we know that y varies directly as the square of (x-3). This can be written as y = k*(x-3)^2, where k is the constant of variation.*

*Next, we know that y = 16 when x = 1. We can substitute these values into the equation to find k. So, 16 = k*(1-3)^2, which simplifies to 16 = k*4. Solving for k, we find that k = 4. Now that we know k, we can find y when x = 10. Substituting these values into the equation, we get y = 4*(10-3)^2, which simplifies to y = 4*49 = 196. So, y = 196 when x = 10.*