Year 11 Mathematics Advanced

Topic: Working with Functions (7 of 12)
Review Questions: Direct and Inverse Variation
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

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Direct and inverse variation

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Direct and inverse variation

1. Recognise and set up the variation model (write the equation, find the constant k)

Q1 Killara 2023 Trial Q14(a) · **1 mark**

The owners of Wilson Tennis Racquets use the equation $pq = T$ to keep the price of their racquets appropriate to the market, where p is the price of a racquet, q is the quantity sold per year and T is a constant. Last year the price was $p = \$100$ and the quantity sold was $q = 4000$. Find T.

Q2 Barker 2023 Trial Q13 · **2 marks**

The frequency F (in beats per minute) that a bird beats its wings is inversely proportional to the length L (in cm) of its wings. A bird with wings of length 14 cm beats them at a frequency of 9 beats per minute. Find an equation relating F and L.

Q3 Blacktown Boys 2023 Trial Q13 · **2 marks**

The number of days D to complete a research project is inversely proportional to the number of researchers R who are working. The project takes 123 days to complete when there are 7 people working on it. Find the equation relating D and R.

Q4 North Sydney Girls 2022 Prelim Q7 · **1 mark**

The number of hours h taken to clean an apartment block is inversely proportional to the square of the number of cleaners C. If it takes 6 cleaners 12.5 hours on average to clean an apartment block, which of the following equations represents this situation?

(A) $h = \dfrac{C^2}{75}$

(B) $C = \dfrac{75}{h^2}$

(C) $h = \dfrac{450}{C^2}$

(D) $C = \dfrac{450}{h^2}$

Q5 North Sydney Girls 2024 Trial Q5 · **1 mark**

The cost $\$c$ of making a box of cookies is inversely proportional to the square of the number of boxes n made. Which of the following is a possible equation of the model?

(A) $cn^2 = 10$

(B) $cn^2 = -10$

(C) $c^2n = 10$

(D) $c^2n = -10$

2. Inverse variation: solve for a new value

Q6 Sydney Boys 2022 Trial Q1 · **1 mark**

The time taken for an orchard to be harvested varies inversely to the number of people picking fruit. If the orchard can be harvested by 35 people in 6 days, how many people would be needed to harvest the orchard in 5 days?

(A) 42

(B) 45

(C) 48

(D) 51

Q7 Cranbrook 2023 Trial Q13 · **2 marks**

The time it takes to complete a task varies inversely with the number of people assigned. It takes 5 people to complete a task in 4 hours. Find the amount of time it would take 8 people to complete the same task.

Q8 St George Girls 2023 Prelim Q16 · **3 marks**

The intensity of a current (C) varies inversely with the resistance (R) in a circuit. The intensity $C = 19$ when $R = 12.5$.

(a) Find the constant of variation (k).

(b) What is the intensity of the current when $R = 30$? (Leave your answer correct to 2 decimal places.)

Q9 North Sydney Girls 2025 Trial Q20 · **2 marks**

It is given that a quantity y varies inversely with the square of x. When $x = 4$, $y = 10$. Find the value of y when $x = 5$.

3. Direct variation and variation with a power (square / cube)

Q10 Sydney Girls 2020 Trial Q13 · **3 marks**

The weight M, in kg, of an object on the moon is directly proportional to the weight E of the object on Earth. An astronaut who weighs 90 kg on Earth weighs 16.4 kg on the moon.

(a) Find an equation for converting the weight of an object on Earth to its weight on the moon.

(b) An astronaut weighs 120 kg on Earth. How much will the astronaut weigh on the moon?

Q11 Killara 2024 Prelim Q16 · **4 marks**

The productivity P of a student is directly proportional to the square of the amount of hours slept in the night before, S. Sam stayed up late the night before school and as a result only had 4 hours of sleep; his productivity the next day was 2 hours.

(a) Calculate the constant of variation.

(b) If Sam wants to be productive for 8 hours in a day, how many hours of sleep will he need in the night before?

Q12 Hornsby Girls 2023 Trial Q12 · **4 marks**

Metal spherical balls are manufactured so that their weight W varies directly with the cube of their radius r. A ball manufactured with a radius of 2.5 cm has a weight of 1.25 kg.

(a) Calculate the radius of a ball manufactured with a weight of 5.12 kg.

(b) Graph the relationship between the radius and weight of the metal spherical balls from $r = 0$ cm to $r = 10$ cm.

4. Model, tabulate and graph a variation relationship

Q13 Hunters Hill 2025 Trial Q1 · **1 mark**

Which of the following represents an inverse variation relationship?

(A) $y = \dfrac{4}{x}$

(B) $y = 4x$

(C) $y = 4$

(D) $y = -4x$

Q14 Manly 2024 Trial Q11 · **3 marks**

It is given that y is inversely proportional to x. When $x = 8$, $y = 2$.

(a) Find the equation relating x and y.

(b) Graph the relationship showing two different points on the graph.

Q15 2022 HSC Q12 · **4 marks**

A student believes that the time it takes for an ice cube to melt (M minutes) varies inversely with the room temperature (T °C). The student observes that at a room temperature of 15 °C it takes 12 minutes for an ice cube to melt.

(a) Find the equation relating M and T.

(b) By first completing this table of values, graph the relationship between temperature and time from $T = 5$ °C to $T = 30$ °C.

T	5	15	30
M			

5. Multi-step variation modelling (harder word problems)

Q16 Penrith 2022 Prelim Q16 · **2 marks**

Two electrical technicians can repair five electrical lines in three hours. After a storm, 50 electrical lines need repairing. How many electrical technicians are needed to repair the electrical lines in one eight-hour working day?

Q17 Barker 2024 Prelim Q13(c) · **3 marks**

The number of hours M that it takes for a block of ice to melt varies inversely with the temperature T. At 32°C it takes 6 hours for a block of ice to melt.

(a) Find an equation for the model in terms of M and T in the form $M = \dfrac{k}{T}$, where k is a constant.

(b) How much longer will it take the same size block of ice to melt at 10°C, compared to 25°C? Leave your answer to the nearest minute.

Q18 North Sydney Girls 2023 Prelim Q32 · **4 marks**

Research shows that the stopping distance d (in metres) of a car once the brakes are applied is directly proportional to the square of the speed v (in km/h) when the brakes are first applied. Assume that the driver's reaction time is neglected. The stopping distance for a car travelling at 60 km/h is 43.2 m.

(a) Show that the stopping distance for a car travelling at 70 km/h is 58.8 m.

(b) Further research shows that the driver's reaction time is an important factor in determining the stopping distance. The average driver takes 1.5 seconds to realise they need to apply the brakes. Calculate the new stopping distance for a car travelling at 70 km/h which takes the reaction time into account.