

PRACTICE 2.2 and 2.3 - Functional Notation and Graphing

* Full, worked solutions can be found in the folder linked on the Course Website ☺

1 Calculate the substitutions indicated for each given function.

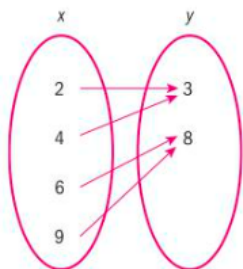
a $g(x) = -x^2 + 2$, $g(-4)$

b $f: x \rightarrow 5x - 1$, $f(-9)$

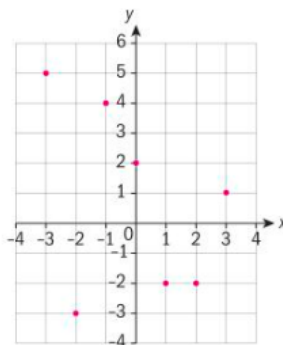
c $C(n) = 20n + 250$, $C(100)$

d $h(x) = -4$, $h(5)$

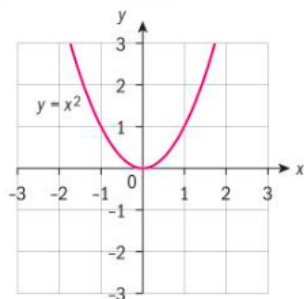
e $f(2)$ for the mapping diagram below



f $f(-3)$ for the graph below



g $f(-1)$ for the graph below



- 2 If $f(x) = -3x^2 - 1$, $g(x) = -4x + 7$ and $h(x) = 6$, find:

- a** $f(-3)$ **b** $g(15)$
c $f(1) + g(-1)$ **d** $h(0)$
e $f(x - 2)$ **f** $g(n)$
g $f(1) \times h(1)$ **h** $f(x + 1) \times g(x - 2)$

- 3 The journey of a car travelling towards Perth, Australia, can be expressed by the relation $d = -75t + 275$, where d is the distance from Perth in km and t is driving time in hours.

- a** Is this relation a function? Justify your answer.
b Rewrite the equation in functional notation.
c At the start of the journey, how far was the car from Perth?
d What values of t do not make sense for this situation?

- 4 To convert a temperature from Celsius to Fahrenheit, we use the formula:

$$F(C) = \frac{9}{5}C + 32.$$

- a** Is this formula a function? Justify your answer.
b Describe what $F(17)$ is asking and calculate the value.

- c** Describe what $F(C) = 100$ is asking and calculate the value of C .
d Use the formula to calculate the temperature in degrees Fahrenheit at which water freezes.
e Use the formula to calculate the temperature in degrees Fahrenheit at which water boils.
f The average body temperature of a dog is 38.75°C . Convert this to degrees Fahrenheit.
g Cookies are typically baked at 350°F . Convert this to degrees Celsius.

- 5 A British telecommunications company offers the following roaming data package to its customers: a flat fee of £25 plus £10 per gigabyte of data

- a** Express the total cost, C , as a function of the number of gigabytes of data (g).
b What values of g do not make sense in this context?

- c** State the notation that could be used to find the roaming cost for a trip where 14 gb of data is used? Calculate this value.
d State the notation that could be used to find the number of gigabytes of data one can use for a total bill of £100. Calculate this value.

[more on back](#) □

Exercise 2C



- 1 Use your GDC to sketch the graphs of the following functions:

a $f(x) = -0.01x^2 + 0.5x + 2.56$

b $g: x \rightarrow 0.44\sqrt{3.2x - 4.1}$

c $y = 2\sin(x + 3) + 2$

- 2 Given $f(x) = x^2 + 1$, $g(x) = -3x + 2$ and $h(x) = \sqrt{x}$, use your GDC to sketch the graphs of the following:

a $f(x) + g(x)$

b $f(x) - h(x)$

c $f(x) \times g(x)$

d $f(x) + g(x) + h(x)$

HINT

For part 1c, be sure your calculator is in radians, and set the window of your GDC so that the x -axis shows from -2π to 2π .

- 3 Use your GDC to help you draw the graphs of the following functions.

a $y = 0.2x^2 + 1.3x - 4.5$

b $f(x) = 3 \times 2^{0.5x+3} - 1$

2. Express the area, A , of a circle as a function of its circumference, C .
3. Express the area, A , of an equilateral triangle as a function of the length, ℓ , of each of its sides.
4. A rectangular swimming pool with dimensions 12 metres by 18 metres is surrounded by a pavement of uniform width x metres. Find the area of the pavement, A , as a function of x .
5. In a right-angled isosceles triangle, the two equal sides have length x units and the hypotenuse has length h units. Write h as a function of x .
6. The pressure P (measured in kilopascals, kPa) for a particular sample of gas is directly proportional to the temperature T (measured in degrees kelvin, K) and inversely proportional to the volume V (measured in litres, L). With k representing the constant of proportionality, this relationship can be written in the form of the equation $P = k \frac{T}{V}$

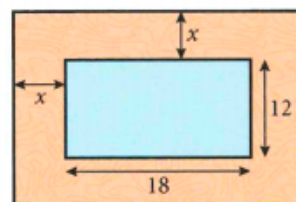


Figure 1.17 Diagram for question 4

- (a) Find the constant of proportionality, k , if 150 L of gas exerts a pressure of 23.5 kPa at a temperature of 375K.
- (b) Using the value of k from part (a) and assuming that the temperature is held constant at 375K, write the volume V as a function of pressure P for this sample of gas.
7. In physics, Hooke's law states that the force F (measured in newtons, N) needed to extend a spring by x units beyond its natural length is directly proportional to the extension x . Assume that the constant of proportionality is k (known as the spring constant for a particular spring).
- (a) Write F as a function of x .
- (b) A spring has a natural length of 12 cm and a force of 25 N stretches the spring to a length of 16 cm. Work out the spring constant k .
- (c) What force is needed to stretch the spring to a length of 18 cm?

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PRACTICE 2.1 – Functions

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Exercise 2A



1 Determine whether each relation below is a function or not. If it is not a function, state the reason why.

a The number of identical marbles and the total mass of the marbles.

b The number of sides in a polygon and the sum of the interior angles.

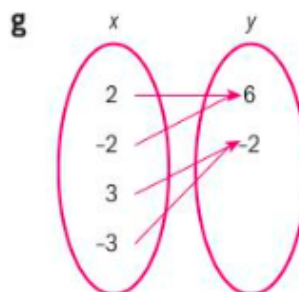
c The number of adult movie tickets purchased and the total cost.

d $\{(0, 1), (1, 2), (2, 3), (3, 4), \dots\}$

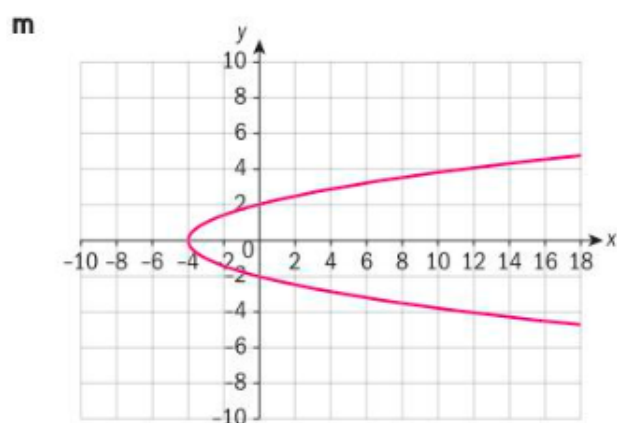
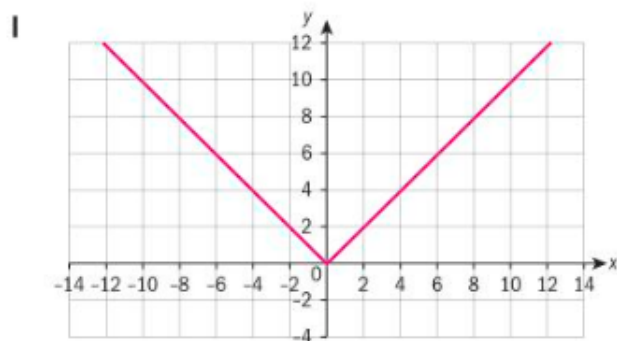
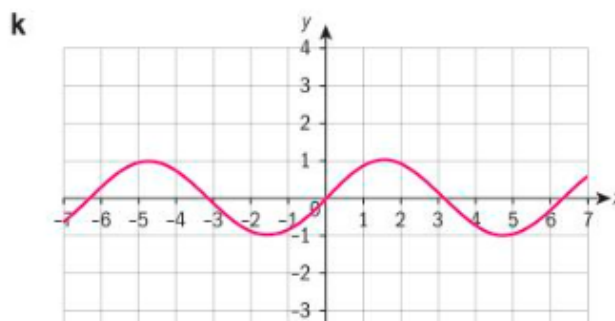
e $\{(1, 0), (0, 1), (2, 0), (0, 2), (3, 0), (0, 3)\}$

f

x	2	3	4	6	7	9
y	1	1	1	1	1	1



h $y = -2x + 6$ i $x = 3$ j $y = x^2$



2 For each of the relation types below, give an example that is **not** a function:

a table of values

b mapping diagram

c equation

d graph

3 Which of the following statements is true? Justify your choice.

All functions are relations, but not all relations are functions.

All relations are functions, but not all functions are relations.