Practice Unit Assessment (3) for National 5 Relationships

1. A straight line with gradient ½ passes through the point (1, 5).

Determine the equation of this straight line.

2. Solve the inequation $5k - 3 < 2k + 9$.

3. A group of friends met in a coffee bar. They paid £9.40 for 4 cappuccinos and 2 lattes.

Write an equation to represent this information.

4. Solve the following system of equations algebraically:

$$5c - 2d = 36$$
$$c + d = 17$$

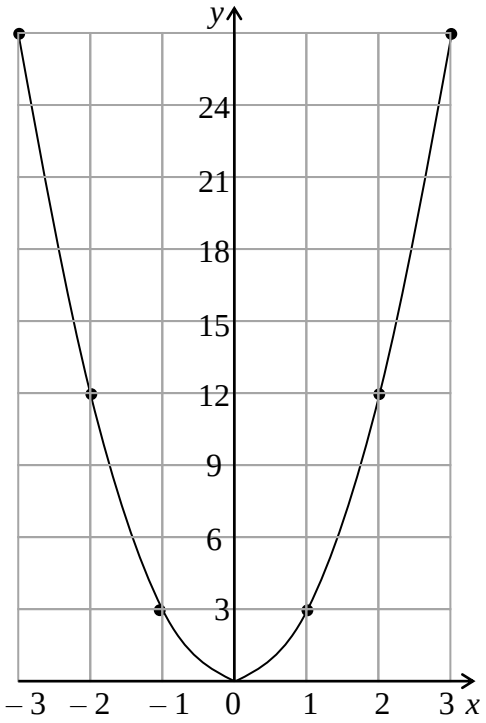
5. Here is a formula

$$k = 7 + \frac{5m}{4}$$

Change the subject of the formula to m.

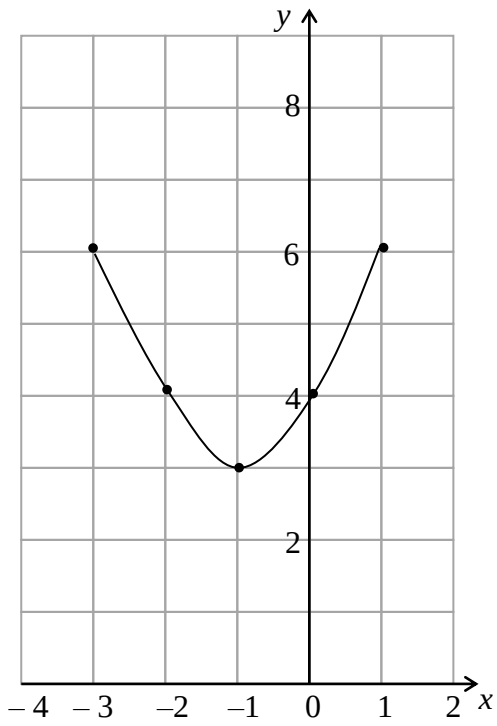
6. The diagram shows the parabola with equation $y = kx^2$

What is the value of k?



7. The equation of the quadratic function whose graph is shown below is of the form $y = (x + a)^2 + b$, where a and b are integers.

Write down the values of a and b.



8. Sketch the graph $y = (x – 4)(x + 2)$ on plain paper.

Mark clearly where the graph crosses the axes and state the coordinates of the turning point.

9. A parabola has equation $y = 5 – (x + 3)^2$.

(a) Write down the equation of its axis of symmetry.

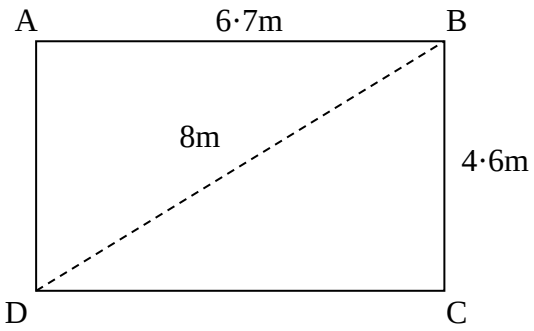
(b) Write down the coordinates of the turning point on the parabola and state whether it is a maximum or minimum.

10. Solve the equation $(x – 7)(x + 1) = 0$

11. Solve the equation $x^2 + 5x – 7 = 0$ using the quadratic formula.

12. Determine the nature of the roots of the equation $9x^2 + 6x + 1 = 0$ using the discriminant.

13. A shape has dimensions as shown.

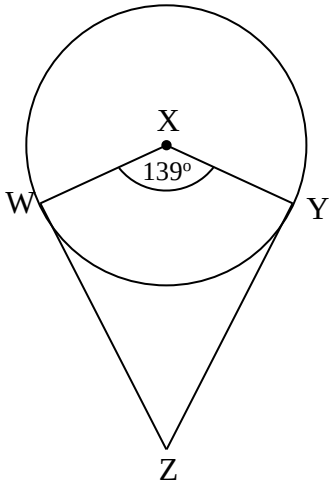


Is angle DAB = 90° in this shape?

14. The diagram shows kite WXYZ and a circle with centre X.

WZ is the tangent to the circle at W and YZ is the tangent to the circle at Y.

Given that angle WXY is 139°, calculate angle WZY.

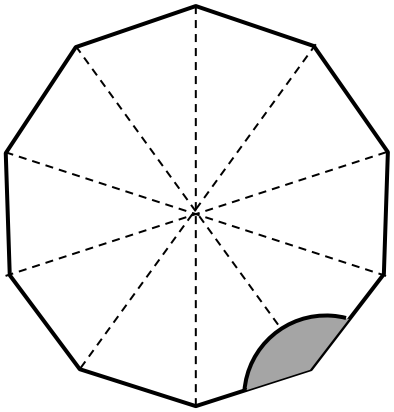


15. A tube of toothpaste is 21 cm long and has a volume of 50cm³

A similar miniature version is 9cm long.

Calculate how much toothpaste the miniature version would hold.

16. Here is a regular, 10 – sided polygon.



Calculate the size of the shaded angle.

17. Sketch the graph of $y = -3\sin x^{o}$ for $0^{\circ} \leq x \leq 360^{\circ}$.

18. Write down the period of the graph of the equation $y = \sin \frac{1}{2} x^{o}$.

19. Solve the equation $5\tan x^{\circ} - 7 = 0$, $0^{\circ} \leq x \leq 360^{\circ}$.

End of Question Paper

Practice Unit Assessment (3) for Relationships: Marking Scheme

Points of reasoning are marked # in the table.

Question	Main points of expected responses	
1	•[1] correct substitution	•[1] $y - 5 = \frac{1}{2}(x - 1)$ (or equivalent)
2	•[1] simplify for k •[2] simplify numbers •[3] solve	•[1] $3k$ •[2] 12 •[3] $k < 4$
3	#2.1 uses correct strategy and sets up equation	#2.1 $4c + 2l = 9 \cdot 4$
4	•[1] multiply by appropriate Factor •[2] solve for c •[3] solve for d	•[1] $5c - 2d = 36$ $5c + 2d = 34$ or equivalent •[2] $c = 10$ •[3] $d = 7$
5	•[1] subtract 7 •[2] multiply by 4 •[3] divide by 5	•[1] $k - 7$ •[2] $(k - 7) \times 4$ (or equivalent) •[3] $\frac{4(k-7)}{5}$ (or equivalent)
6	•[1] correct value of k	•[1] $k = 3$
7	•[1] find value of 'a' •[2] find value of 'b'	•[1] $a = 1$ •[2] $b = 3$
8	•[1] identify and annotate roots and y-intercept •[2] identify and annotate turning point •[3] draw correct shape of graph	•[1] –2, 4 and (0, –8) •[2] (1, –9) •[3] correctly annotated graph
9 (a) **(b)**	•[1] axis of symmetry •[2] turning point •[3] nature	•[1] $x = -3$ •[2] (–3, 5) •[3] maximum turning point
10	•[1] solve equation	•[1] $x = -1, x = 7$
11	•[1] correct substitution	•[1] $\frac{-5 \pm \sqrt{5^2 - 4 \times 1 \times -7}}{2}$

	•^{2} evaluation discriminant •^{3} solve for 1 root •^{4} complete solution	•^{2} 53 •^{3} $x = 1{\cdot}1$ •^{4} $x = -6{\cdot}1$ (rounding not required)
12	•^{1} correct substitution •^{2} evaluate discriminant #2.2 interpret result	•^{1} $(6)^2 - 4 \times 9 \times 1$ •^{2} #2.2 equal roots since $b^2 - 4ac = 0$
13	•^{1} calculates and adds squares of two short sides •^{2} squares longest side #2.2 interprets result	•^{1} $4{\cdot}6^2 + 6{\cdot}7^2 = 66{\cdot}05$ •^{2} $8^2 = 64$ #2.2 so $4{\cdot}6^2 + 6{\cdot}7^2 \neq 8^2$ and hence triangle is not right-angled using converse of Pythagoras. Angle DAB is not a right angle.
14	•^{1} radius and tangent •^{2} subtract •^{3} correct answer	•^{1} either angle ZWX or angle ZYX = 90° •^{2} 360 – (90 + 90 + 139) •^{3} 41°
15	•^{1} use volume scale factor •^{2} correct answer	•^{1} $(9/21)^3 \times 50$ •^{2} 4 cm^3
16	#2.1 use a valid strategy •^{1} correct answer	#2.1 eg centre angles 360/10 = 36° each •^{1} 144°
17	•^{1} correct amplitude and period •^{2} correctly annotated graph complete with roots and amplitude.	•^{1} – 3 / 3 and 360° •^{2} Correct graph
18	•^{1} correct period	•^{1} 720°
19	•^{1} solve for tan x° •^{2} solve for x •^{3} complete solution	•^{1} tan x° = 1·4 •^{2} 54·5° •^{3} 234·5°