

Practice Unit Assessment (1) for National 5 Relationships

1. A straight line with gradient -3 passes through the point $(-2, 5)$.

Determine the equation of this straight line.

2. Solve the inequation $4p - 12 < p + 6$.

3. The Stuart family visit a new attraction in Edinburgh. They paid £32.25 for 3 adult tickets and 2 child tickets.

Write an equation to represent this information.

4. Solve the following system of equations algebraically:

$$\begin{aligned}3a + 5b &= 39 \\ a - b &= -3\end{aligned}$$

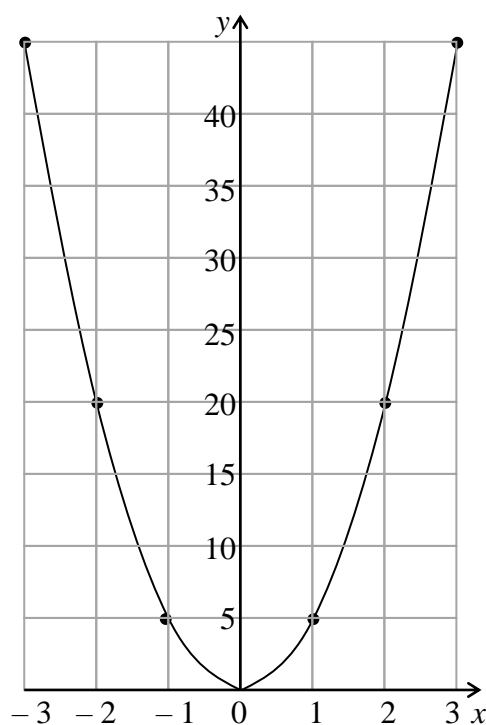
5. Here is a formula

$$S = \frac{2x}{3} + 6$$

Change the subject of the formula to x .

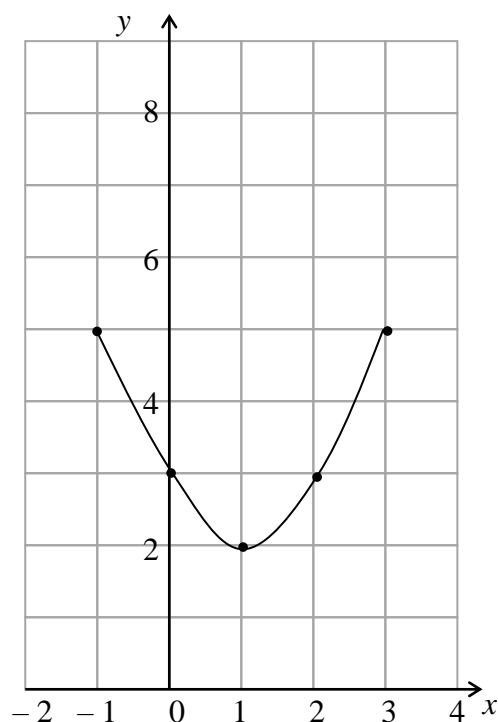
6. The diagram shows the parabola with equation $y = kx^2$.

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 $y = (x - 1)(x + 3)$ on plain paper.

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

9. A parabola has equation $y = (x - 3)^2 + 4$.

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

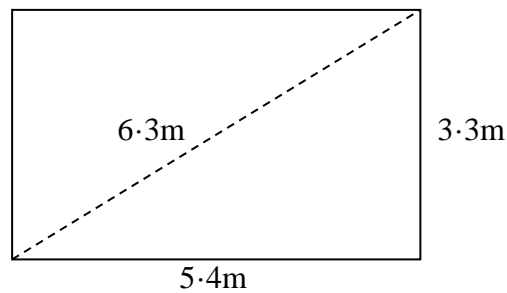
(b) Write down the coordinates of the turning point on the parabola and state whether it is a maximum or minimum.

10. Solve the equation $(x - 3)(x + 7) = 0$

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

12. Determine the nature of the roots of the equation $3x^2 + 2x - 1 = 0$ using the discriminant.

13. To check that a room has perfect right angles, a builder measures two sides of the room and its diagonal. The measurements are shown in this diagram.

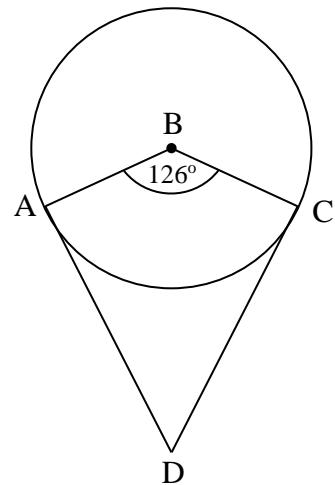


Are the corners of the room right – angled?

14. The diagram shows kite ABCD and a circle with centre B.

AD is the tangent to the circle at A and CD is the tangent to the circle at C.

Given that angle ABC is 126° , calculate angle ADC.

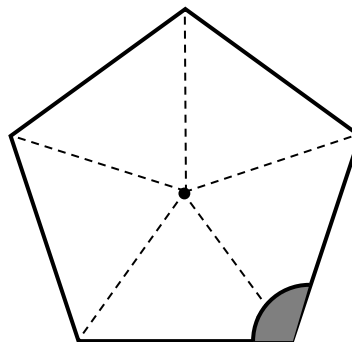


15. A water container is in the shape of a cylinder which is 150 cm long. The volume of water in the container is $12\,000\text{ cm}^3$.

A similar miniature version is 15cm long.

Calculate how much water the miniature version would hold.

16. Here is a regular, 5 – sided polygon.



Calculate the size of the shaded angle.

17. Sketch the graph of $y = 4\sin x^\circ$ for $0^\circ \leq x \leq 360^\circ$.
18. Write down the period of the graph of the equation $y = \cos 3x^\circ$.
19. Solve the equation $4\sin x^\circ - 1 = 0$, $0^\circ \leq x \leq 360^\circ$.

End of Question Paper

Practice Unit Assessment (1) for Relationships:**Marking Scheme**

Points of reasoning are marked # in the table.

Question	Main points of expected responses	
1	<ul style="list-style-type: none"> •¹ correct substitution 	<ul style="list-style-type: none"> •¹ $y - 5 = -3(x - (-2))$ (or equivalent)
2	<ul style="list-style-type: none"> •¹ simplify for p •² simplify numbers •³ solve 	<ul style="list-style-type: none"> •¹ $3p$ •² 18 •³ $p < 6$
3	#2.1 uses correct strategy and sets up equation	#2.1 $3a + 2c = 32 \cdot 25$
4	<ul style="list-style-type: none"> •¹ multiply by appropriate Factor •² solve for a •³ solve for b 	<ul style="list-style-type: none"> •¹ $3a + 5b = 39$ $5a - 5b = -15$ or equivalent •² $a = 3$ •³ $b = 6$
5	<ul style="list-style-type: none"> •¹ subtract 6 •² multiply by 3 •³ divide by 2 	<ul style="list-style-type: none"> •¹ $S - 6$ •² $(S - 6) \times 3$ (or equivalent) •³ $\frac{3(S - 6)}{2}$ (or equivalent)
6	<ul style="list-style-type: none"> •¹ correct value of k 	<ul style="list-style-type: none"> •¹ $k = 5$
7	<ul style="list-style-type: none"> •¹ find value of 'a' •² find value of 'b' 	<ul style="list-style-type: none"> •¹ $a = -1$ •² $b = 2$
8	<ul style="list-style-type: none"> •¹ identify and annotate roots and y-intercept •² identify and annotate turning point •³ draw correct shape of graph 	<ul style="list-style-type: none"> •¹ $-3, 1$ and $(0, -3)$ •² $(-1, -4)$ •³ correctly annotated graph
9 (a)	<ul style="list-style-type: none"> •¹ axis of symmetry 	<ul style="list-style-type: none"> •¹ $x = 3$
(b)	<ul style="list-style-type: none"> •² turning point •³ nature 	<ul style="list-style-type: none"> •² $(3, 4)$ •³ minimum turning point
10	<ul style="list-style-type: none"> •¹ solve equation 	<ul style="list-style-type: none"> •¹ $x = -7, x = 3$
11	<ul style="list-style-type: none"> •¹ correct substitution 	<ul style="list-style-type: none"> •¹ $\frac{-2 \pm \sqrt{2^2 - 4 \times 1 \times -7}}{2}$

	<ul style="list-style-type: none"> •² evaluation discriminant •³ solve for 1 root •⁴ complete solution 	<ul style="list-style-type: none"> •² 32 •³ $x = 1.8$ •⁴ $x = -3.8$ (rounding not required)
12	<ul style="list-style-type: none"> •¹ correct substitution •² evaluate discriminant <p>#2.2 interpret result</p>	<ul style="list-style-type: none"> •¹ $(2)^2 - 4 \times 3 \times -1$ •² 16 <p>#2.2 real and unequal roots Since $b^2 - 4ac > 0$</p>
13	<ul style="list-style-type: none"> •¹ calculates and adds squares of two short sides •² squares longest side <p>#2.2 interprets result</p>	<ul style="list-style-type: none"> •¹ $3 \cdot 3^2 + 5 \cdot 4^2 = 40.05$ •² $6 \cdot 3^2 = 39.69$ <p>#2.2 so $3 \cdot 3^2 + 5 \cdot 4^2 \neq 6 \cdot 3^2$ and hence triangle is not right-angled using converse of Pythagoras. The corners of the room are not right angled.</p>
14	<ul style="list-style-type: none"> •¹ radius and tangent •² subtract •³ correct answer 	<ul style="list-style-type: none"> •¹ either angle BAD or angle BCD = 90° •² $360 - (90 + 90 + 126)$ •³ 54°
15	<ul style="list-style-type: none"> •¹ use volume scale factor •² correct answer 	<ul style="list-style-type: none"> •¹ $(15/150)^3 \times 12000$ •² 12 cm^3
16	<p>#2.1 use a valid strategy</p> <ul style="list-style-type: none"> •¹ correct answer 	<p>#2.1 eg centre angles $360/5 = 72^\circ$ each</p> <ul style="list-style-type: none"> •¹ 108°
17	<ul style="list-style-type: none"> •¹ correct amplitude and period •² correctly annotated graph complete with roots and amplitude. 	<ul style="list-style-type: none"> •¹ $4 / -4$ and 360° •² Correct graph
18	<ul style="list-style-type: none"> •¹ correct period 	<ul style="list-style-type: none"> •¹ 120°
19	<ul style="list-style-type: none"> •¹ solve for $\sin x^\circ$ •² solve for x •³ complete solution 	<ul style="list-style-type: none"> •¹ $\sin x^\circ = 0.25$ •² 14.5° •³ 165.5°