

Dalkeith High School



National 5 Maths Relationships Revision Booklet

Revision Questions

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National 5 Relationships Revision Questions

Assessment Standard 1.1

Exercise 1

Find the equations of the straight lines below:

(a) Gradient = 2 passing through (4, 5)

(b) $m = 3$ passing through (-1, 2)

(c) Gradient = -3 passing through (3, -5)

(d) $m = -1$ passing through (-2, -4)

Exercise 2 Solve the following inequations.

a) $5x + 3 > 3x + 11$

b) $4y - 4 \leq y + 5$

c) $3w + 5 < w - 3$

d) $8k - 1 \geq 3k - 11$

Exercise 3

a) Annie bought 3 CD's and 2 DVD's at a total cost of £31. Write an equation to represent this information.

b) 3 adult tickets and 4 child tickets for a football match cost £75. Write an equation to represent this information.

Exercise 4

Solve each of the following systems of equations algebraically

(a) $4x + 3y = 17$

(b) $6t - 4r = 10$

(c) $3a + 5b = 29$

$5x - y = 7$

$5t + r = 4$

$4a + 3b = 24$

Exercise 5

Change the subject of the following formulas to x

(a) $y = 2x + q$

(b) $p = u + vx$

(c) $C = 2\pi x$

(d) $s = \frac{2\pi}{x^2}$

(e) $M = 3(2x + 1)$

(f) $v^2 = u^2 + 2ax$

Answers

Exercise 1 a) $2x-3$ b) $-x+1$ c) $-3x+4$ d) $-x-6$

Exercise 2 a) $x>4$ b) $y\leq 3$ c) $w<-4$ d) $k\geq -2$

Exercise 3 a) $3c + 2d = 31$ b) $3a + 4c = 75$

Exercise 4 a) $x=2, y=3$ b) $t=1, r=-1$ c) $a=3, b=4$

Exercise 5 a) $x = \frac{y-q}{2}$ b) $x = \frac{p-u}{v}$ c) $x = \frac{c}{2\pi}$

d) $x = \sqrt{\frac{2\pi}{s}}$ e) $x = \frac{M-3}{6}$ f) $x = \frac{v^2-u^2}{2a}$

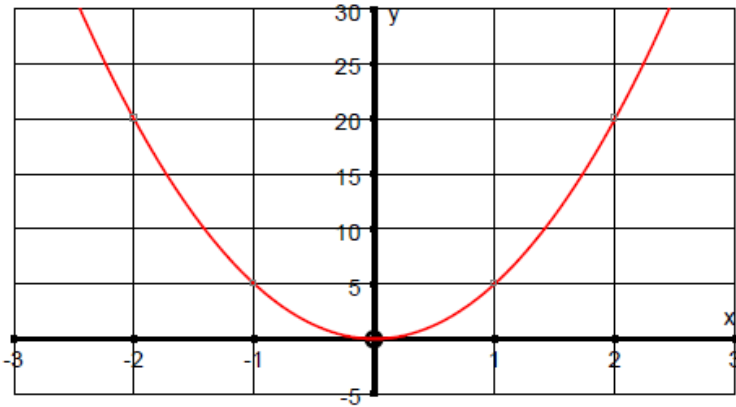
Assessment Standard 1.2

Exercise 6

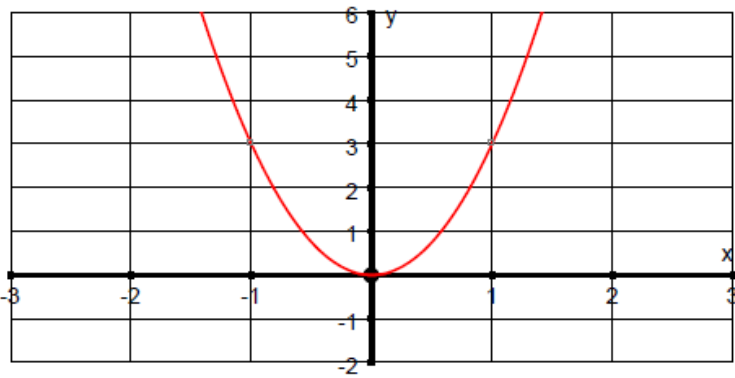
The diagrams below show parabolas with equation $y = kx^2$

What is the value of k ?

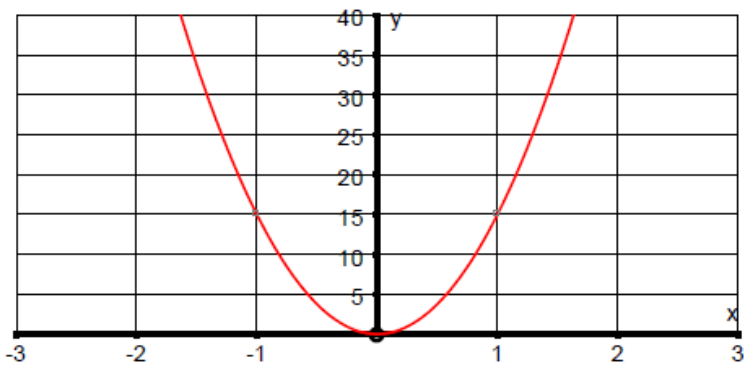
a)



b)

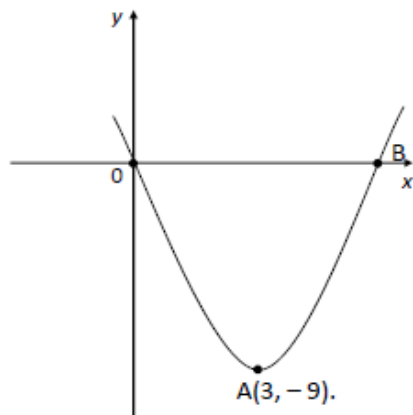


c)



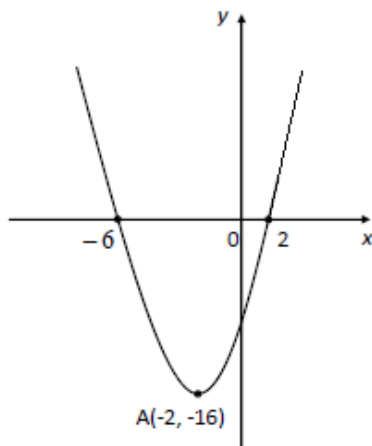
Exercise 7

- a) The diagram shows part of the graph of the parabola which has a minimum turning point at $(3, -9)$.

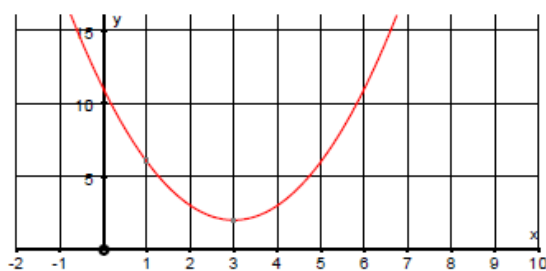


- (i) Write down the equation of the parabola in the form $y = (x - a)^2 + b$
- (ii) The parabola cuts the x -axis at the origin and the point B.
What is the length of OB?

- b) 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 .



- c) The graph of a quadratic function is shown below.
The coordinates of its turning point is $(3, 2)$.
The equation of the function can be written in the form $y = (x + a)^2 + b$, where a and b are integers. Write down the values of a and b .



Exercise 8

On plain paper sketch the following graphs.

Mark clearly the x and y intercepts and state the coordinates of the turning point for each graph.

(a) $y = (x - 3)(x + 7)$

(b) $y = (x - 1)(x - 3)$

(c) $y = (x + 2)(x - 4)$

Exercise 9

The equations of three parabolas are given below.

For each, (i) State the equation of the axis of symmetry

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

(a) $y = (x - 4)^2 - 3$

(b) $y = (x + 2)^2 + 5$

(c) $y = 2 - (x - 1)^2$

Answers

Exercise 6 a) $k=5$ b) $k=3$ c) $k=15$

Exercise 7 a) (i) $y = (x - 3)^2 - 9$ (ii) 6 b) $a=2, b=16$

Exercise 8 Ask your teacher to check this exercise.

Exercise 9 a) (i) $x=4$, (ii) (4,3) Minimum

b) (i) $x=-2$, (ii) (-2,5) Minimum

c) (i) $x=1$, (ii) (1,2) Maximum

Assessment Standard 1.3

Exercise 10

Solve the equations:

(a) $(x - 3)(x + 4) = 0$

(b) $(x + 1)(x - 7) = 0$

(c) $(2x - 3)(x + 4) = 0$

(d) $(x - 2)^2 = 0$

Exercise 11

Solve the following equations using the quadratic formula:

(a) $x^2 + 3x + 2 = 0$

(b) $x^2 - 5x + 6 = 0$

(c) $x^2 - x - 4 = 0$

(d) $2w^2 + 12w + 9 = 0$

Exercise 12

Determine the nature of the roots of the following equations using the discriminant.

(a) $3x^2 - 7x + 2 = 0$

(b) $x^2 - 3x + 4 = 0$

(c) $x^2 + 8x + 16 = 0$

(d) $2x^2 + 3x - 4 = 0$

Answers

Exercise 10 a) 3,-4 b) -1,7 c) $\frac{3}{2}, -4$ d) 2

Exercise 11 a) -1,-2 b) 2,3 c) -1.56, 2.56 d) -4.06, -1.94

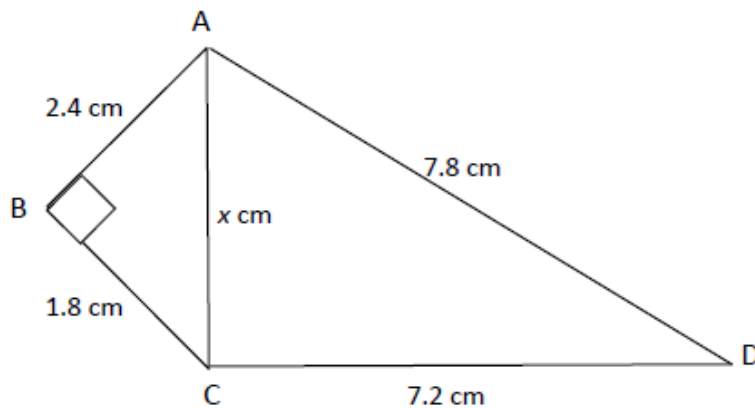
Exercise 12 a) 2 real roots b) no real roots c) equal roots d) 2 real roots

Assessment Standard 1.4

Exercise 13

- a) Does a triangle with sides 18.6cm, 24.8cm and 31.2cm have a right angle? Justify your answer.
- b) Is a triangle with sides 11.7cm, 15.6cm and 19.5cm right angled? Justify your answer.
- c) Triangle ABC is right angled at B. (i) Calculate x .

(ii) Prove that $\angle ACD = 90^\circ$

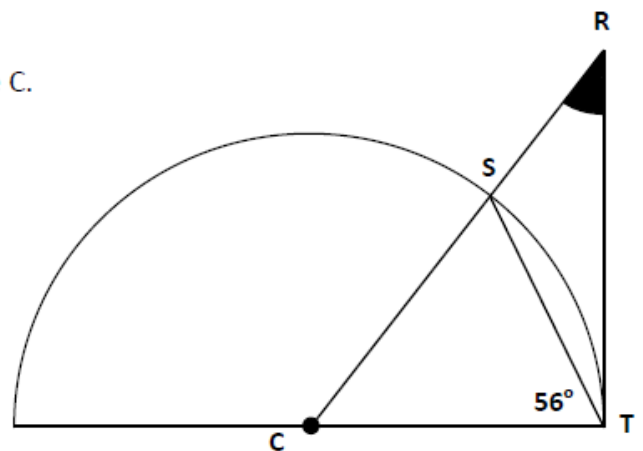


Exercise 14

- a) The diagram shows a semi-circle with centre C.

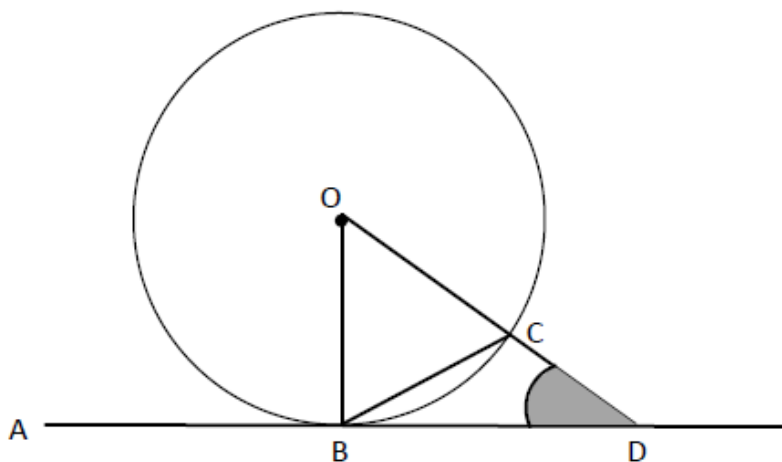
RT is a tangent to the semi-circle at T.

Calculate the size of the shaded angle.



- b) In the diagram, AD is a tangent to the circle centre O with its point of contact at B. C lies on the circumference of the circle and angle DBC = 34°.

Calculate the size of the shaded angle CDB.

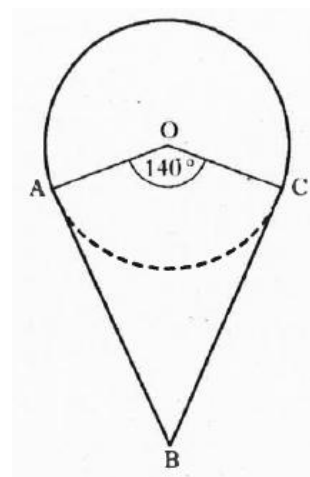


- c) Kite OABC and a circle with centre O are shown.

AB is a tangent to the circle at A.

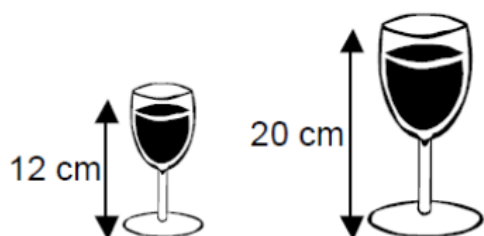
BC is a tangent to the circle at C.

Given that angle AOC = 140°, calculate angle ABC.



Exercise 15

- a) The wine glasses shown are similar in shape.

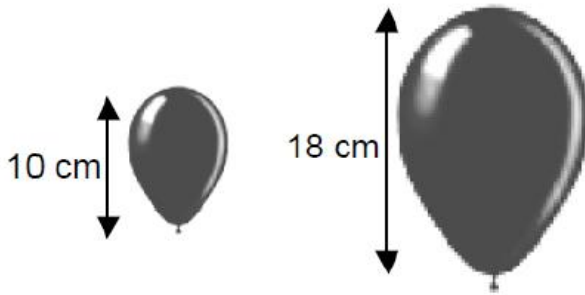


The smaller glass holds 135ml of wine.

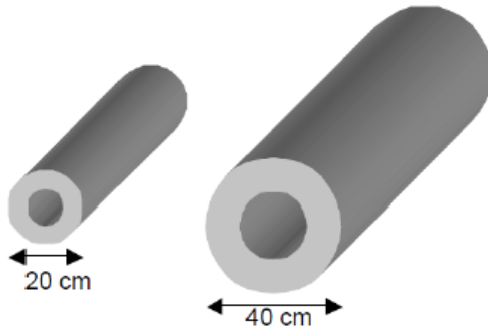
How much does the larger glass hold?

- b) The two balloons shown in the diagram are similar in shape. The larger balloon has a volume of 2187 cm^3 .

Calculate the volume of the smaller balloon.

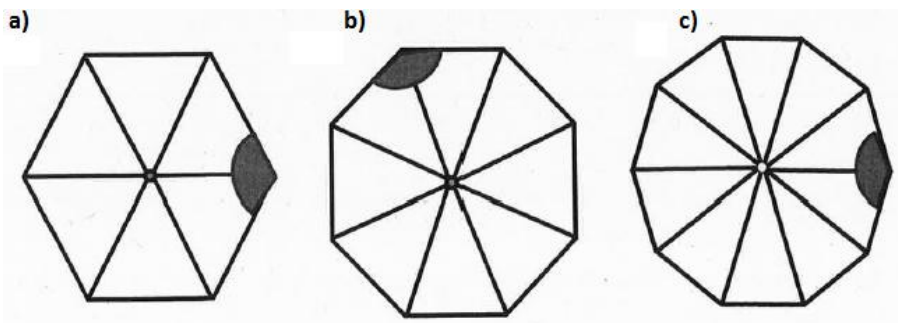


- c) Two metal pipes are similar in volume. The smaller pipe has a volume of 8000 cm^3 . Find the volume of the larger pipe.



Exercise 16

Calculate the size of the shaded angle in these regular polygons:



Answers

- Exercise 13 a) No b) Yes c)(i) 3 (ii) Converse of Pythagoras
- Exercise 14 a) (ii) 22° b) 22° c) 40°
- Exercise 15 a) 625 cm^3 b) 375 cm^3 c) 64000 cm^3
- Exercise 16 a) 120° b) 135° c) 144°

Assessment Standard 1.5

Exercise 17

Sketch the graph of

- (a) $y = 2\sin x^\circ$ for $0^\circ \leq x \leq 360^\circ$.
- (b) $y = 4\sin x^\circ$ for $0^\circ \leq x \leq 360^\circ$.
- (c) $y = 2\cos x^\circ$ for $0^\circ \leq x \leq 360^\circ$.
- (d) $y = 3\cos x^\circ$ for $0^\circ \leq x \leq 360^\circ$.
- (e) $y = 6\sin x^\circ$ for $0^\circ \leq x \leq 360^\circ$.
- (f) $y = 10\cos x^\circ$ for $0^\circ \leq x \leq 360^\circ$.

Exercise 18

Write down the period

- (a) $y = \sin 3x^\circ$
- (b) $y = \cos 3x^\circ$
- (c) $y = \sin 4x^\circ$
- (d) $y = \cos 6x^\circ$
- (e) $y = 2\sin 3x^\circ$
- (f) $y = 4\cos 2x^\circ$
- (g) $y = 6\sin 10x^\circ$
- (h) $y = 3\sin 4x^\circ$

Exercise 19

Solve the equations.

(a) $10\sin x - 1 = 0, \quad 0^\circ \leq x \leq 360^\circ.$

(b) $5\cos x - 2 = 0, \quad 0^\circ \leq x \leq 360^\circ.$

(c) $6\sin x - 1 = 0, \quad 0^\circ \leq x \leq 360^\circ.$

(d) $2\tan x - 7 = 0, \quad 0^\circ \leq x \leq 360^\circ.$

(e) $10\cos x - 2 = 0, \quad 0^\circ \leq x \leq 360^\circ.$

(f) $9\sin x - 6 = 2, \quad 0^\circ \leq x \leq 360^\circ.$

(g) $3\cos x + 6 = 8, \quad 0^\circ \leq x \leq 360^\circ.$

Answers

Exercise 17 (Ask your teacher)

Exercise 18 a) 120° b) 120° c) 90° d) 60° e) 120° f) 180° g) 36° h) 90°

Exercise 19 a) 5.7° and 174.3° b) 66.4° and 293.6° c) 9.6° and 170.4° d) 74.1° and 254.1°
e) 78.5° and 281.5° f) 62.7° and 117.3° g) 48.2° and 311.8°

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:

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

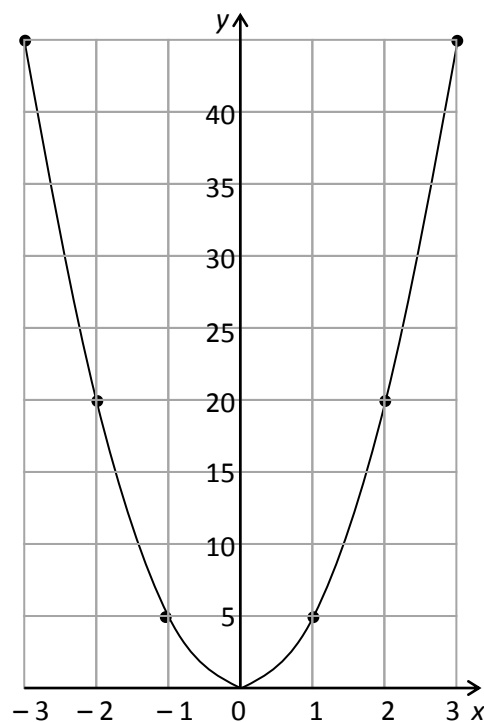
5. Here is a formula

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

Change the subject of the formula to x .

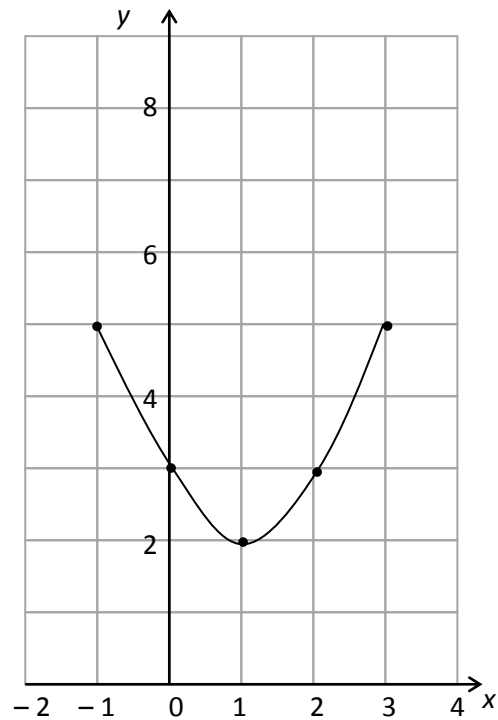
6. The diagram shows the parabola with equation $y = kx^2$.

What is the value of k ?



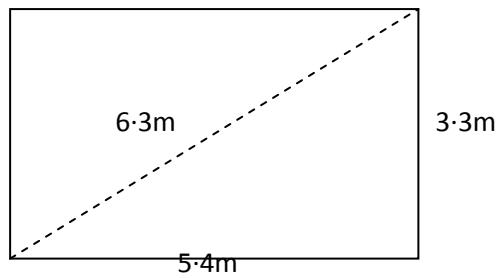
7. The equation of the quadratic function whose graph is shown below is of the form $y = (x + a)^2 + b$, where a and b are integers.

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.

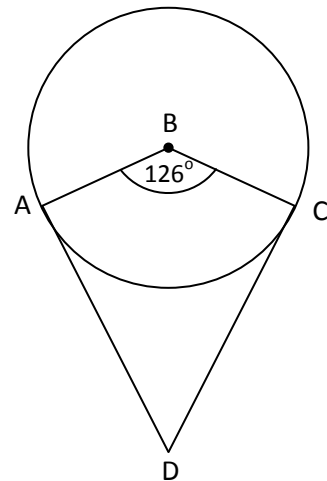


Are the corners of the room right – angled?

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.

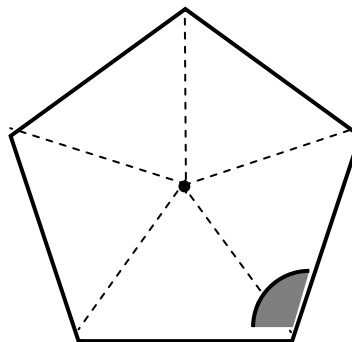


15. A water container is in the shape of a cylinder which is 150 cm long. The volume of water in the container is $12\,000\text{ cm}^3$.

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	• ¹ correct substitution	• ¹ $y - 5 = -3(x - (-2))$ (or equivalent)
2	• ¹ simplify for p • ² simplify numbers • ³ solve	• 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	• ¹ multiply by appropriate Factor • ² solve for a • ³ solve for b	• ¹ $3a + 5b = 39$ $5a - 5b = -15$ or equivalent • ² $a = 3$ • ³ $b = 6$
5	• ¹ subtract 6 • ² multiply by 3 • ³ divide by 2	• ¹ $S - 6$ • ² $(S - 6) \times 3$ (or equivalent) • ³ $\frac{3(S - 6)}{2}$ (or equivalent)
6	• ¹ correct value of k	• ¹ $k = 5$
7	• ¹ find value of 'a' • ² find value of 'b'	• ¹ $a = -1$ • ² $b = 2$
8	• ¹ identify and annotate roots and y-intercept • ² identify and annotate turning point • ³ draw correct shape of graph	• ¹ $-3, 1$ and $(0, -3)$ • ² $(-1, -4)$ • ³ correctly annotated graph
9 (a)	• ¹ axis of symmetry	• ¹ $x = 3$
(b)	• ² turning point • ³ nature	• ² $(-3, 4)$ • ³ minimum turning point
10	• ¹ solve equation	• ¹ $x = -7, x = 3$
11	• ¹ correct substitution	• ¹ $\frac{-2 \pm \sqrt{2^2 - 4 \times 1 \times -7}}{2}$ • ² 32

	<ul style="list-style-type: none"> •² evaluation discriminant •³ solve for 1 root •⁴ complete solution 	<ul style="list-style-type: none"> •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°

Practice Unit Assessment (2) for National 5 Relationships

1. A straight line with gradient 4 passes through the point (2, -4).

Determine the equation of this straight line.

2. Solve the inequation $7m + 5 < 2m + 30$.

3. The Clelland family visit a new attraction in Inverness. They paid £29.40 for 2 adult tickets and 4 child tickets.

Write an equation to represent this information.

4. Solve the following system of equations algebraically:

$$\begin{aligned}7x + 2y &= 32 \\2x - y &= 6\end{aligned}$$

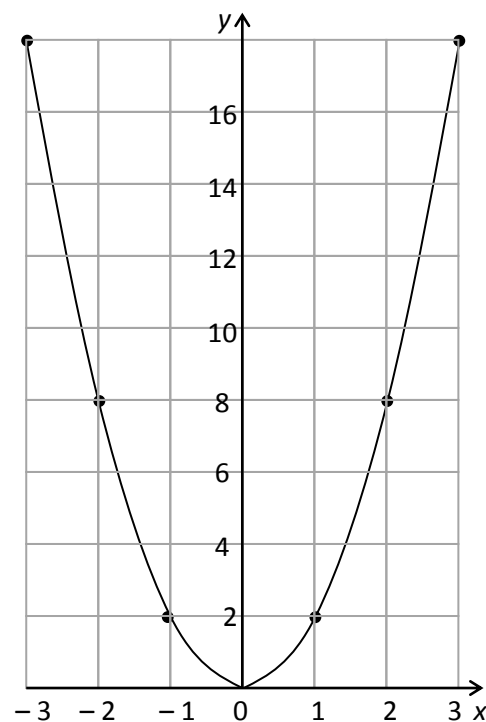
5. Here is a formula

$$A = \frac{4B}{5} - 2$$

Change the subject of the formula to B .

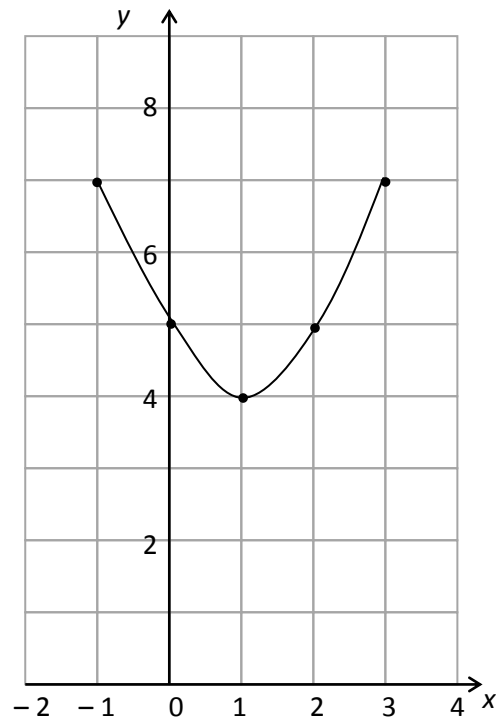
6. The diagram shows the parabola with equation $y = kx^2$.

What is the value of k ?



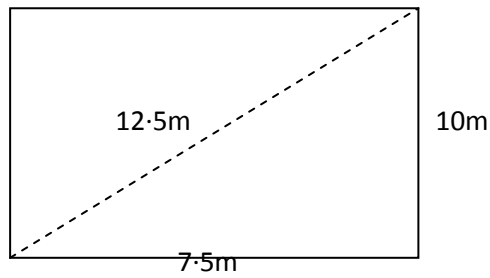
7. The equation of the quadratic function whose graph is shown below is of the form $y = (x + a)^2 + b$, where a and b are integers.

Write down the values of a and b .



8. Sketch the graph $y = (x - 5)(x - 7)$ on plain paper.
Mark clearly where the graph crosses the axes and state the coordinates of the turning point.
9. A parabola has equation $y = (x + 4)^2 - 3$.
- (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 $(x - 10)(x + 5) = 0$
11. Solve the equation $x^2 - 3x - 2 = 0$ using the quadratic formula.
12. Determine the nature of the roots of the equation $4x^2 + 3x + 5 = 0$ using the discriminant.

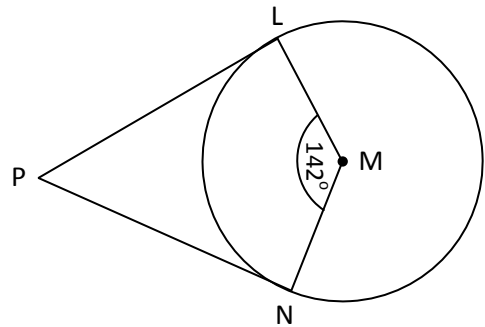
13. A shape has dimensions as shown in the diagram.



Kalen thinks it is a rectangle. Is he correct?

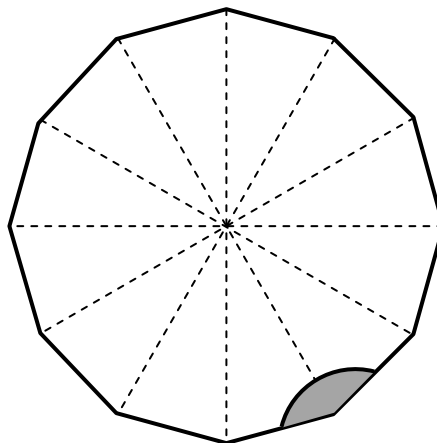
14. The diagram shows kite PNML and a circle with centre M.
PL is the tangent to the circle at L and PN is the tangent to the circle at N.

Given that angle LMN is 142° , calculate angle LPN.



15. A cuboid has length 30 cm and a volume of 1500 cm^3
A similar miniature version is 10 cm long.
Calculate the volume of the miniature cuboid.

16. Here is a regular, 12 – sided polygon.



Calculate the size of the shaded angle.

17. Sketch the graph of $y = 7\cos x^\circ$ for $0^\circ \leq x \leq 360^\circ$.

18. Write down the period of the graph of the equation $y = \sin 5x^\circ$.

19. Solve the equation $7\cos x^\circ - 2 = 0$, $0^\circ \leq x \leq 360^\circ$.

End of Question Paper

Practice Unit Assessment (2) for Relationships:

Marking Scheme

Points of reasoning are marked # in the table.

Question	Main points of expected responses	
1	• ¹ correct substitution	• ¹ $y + 4 = 4(x - 2)$ (or equivalent)
2	• ¹ simplify for m • ² simplify numbers • ³ solve	• ¹ $5m$ • ² 25 • ³ $m < 25$
3	#2.1 uses correct strategy and sets up equation	#2.1 $2a + 4c = 29 \cdot 4$
4	• ¹ multiply by appropriate factor • ² solve for x • ³ solve for y	• ¹ $7x + 2y = 32$ $4x - 2y = 12$ or equivalent • ² $x = 4$ • ³ $y = 2$
5	• ¹ add 2 • ² multiply by 5 • ³ divide by 4	• ¹ $A + 2$ • ² $(A + 2) \times 5$ (or equivalent) • ³ $\frac{5(A + 2)}{4}$ (or equivalent)
6	• ¹ correct value of k	• ¹ $k = 2$
7	• ¹ find value of 'a' • ² find value of 'b'	• ¹ $a = -1$ • ² $b = 4$
8	• ¹ identify and annotate roots and y-intercept • ² identify and annotate turning point • ³ draw correct shape of graph	• ¹ 5, 7 and (0, 35) • ² (6, -1) • ³ correctly annotated graph
9 (a)	• ¹ axis of symmetry	• ¹ $x = -4$
(b)	• ² turning point • ³ nature	• ² (-4, -3) • ³ minimum turning point
10	• ¹ solve equation	• ¹ $x = -5, x = 10$
11	• ¹ correct substitution	• ¹ $\frac{3 \pm \sqrt{3^2 - 4 \times 1 \times -2}}{2}$ • ² 17

	<ul style="list-style-type: none"> •² evaluation discriminant •³ solve for 1 root •⁴ complete solution 	<ul style="list-style-type: none"> •³ $x = 3.6$ •⁴ $x = -0.6$ (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 $(3)^2 - 4 \times 4 \times 5$ •² -71 <p>#2.2 roots are not real 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 $7.5^2 + 10^2 = 156.25$ •² $12.5^2 = 156.25$ <p>#2.2 so $7.5^2 + 10^2 = 12.5^2$ and hence triangle is right-angled using converse of Pythagoras. The shape is a rectangle</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 PLM or angle MNP = 90° •² $360 - (90 + 90 + 142)$ •³ 38°
15	<ul style="list-style-type: none"> •¹ use volume scale factor •² correct answer 	<ul style="list-style-type: none"> •¹ $(10/30)^3 \times 15000$ •² 55.6 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 $360/12 = 30^\circ$ each</p> <ul style="list-style-type: none"> •¹ 150°
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 $7 / -7$ and 360° •² Correct graph
18	<ul style="list-style-type: none"> •¹ correct period 	<ul style="list-style-type: none"> •¹ 72°
19	<ul style="list-style-type: none"> •¹ solve for $\cos x^\circ$ •² solve for x •³ complete solution 	<ul style="list-style-type: none"> •¹ $\cos x^\circ = 2/7$ •² 73.4° •³ 286.6°

Practice Unit Assessment (3) for National 5 Relationships

1. A straight line with gradient $\frac{1}{2}$ 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:

$$\begin{aligned}5c - 2d &= 36 \\ c + d &= 17\end{aligned}$$

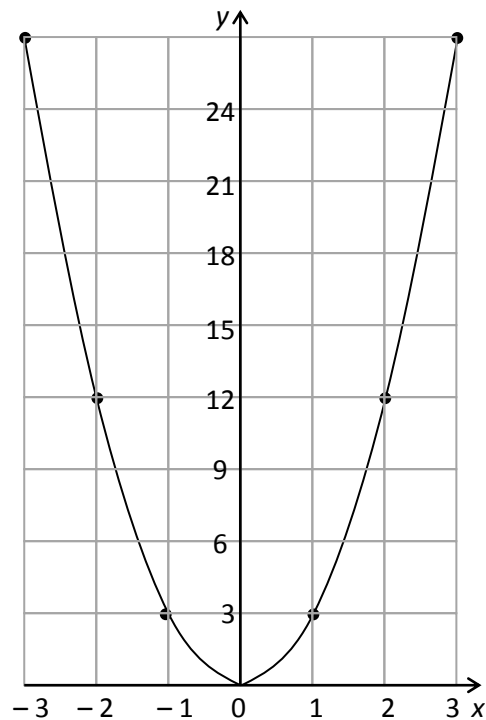
5. Here is a formula

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

Change the subject of the formula to m .

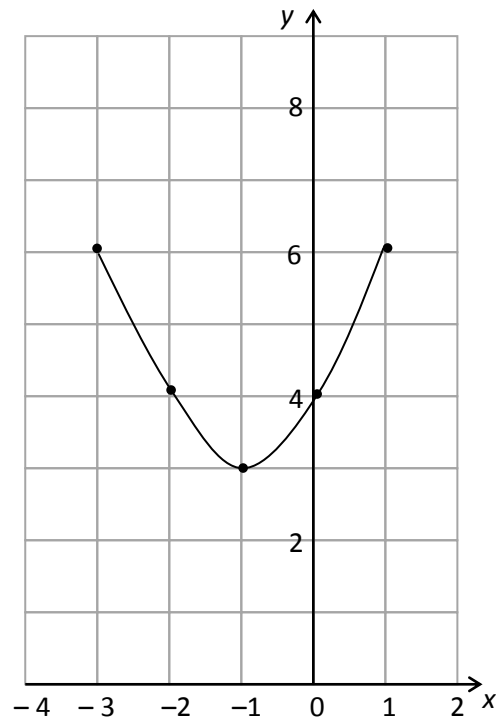
6. The diagram shows the parabola with equation $y = kx^2$

What is the value of k ?



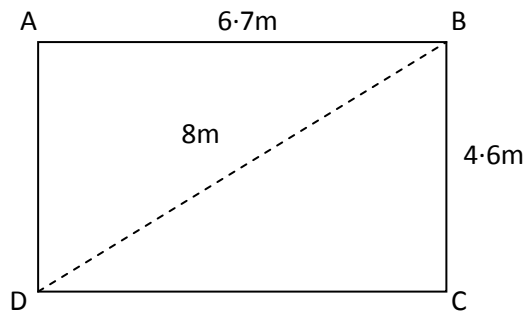
7. The equation of the quadratic function whose graph is shown below is of the form $y = (x + a)^2 + b$, where a and b are integers.

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.

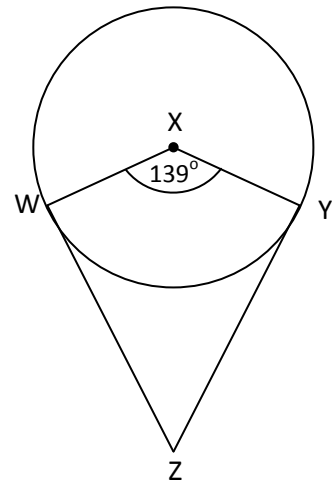


Is angle DAB = 90° in this shape?

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.

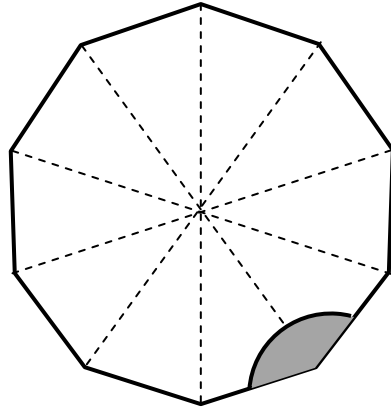


15. A tube of toothpaste is 21 cm long and has a volume of 50cm^3

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 $y = -3\sin x^\circ$ for $0^\circ \leq x \leq 360^\circ$.
18. Write down the period of the graph of the equation $y = \sin \frac{1}{2} x^\circ$.
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)	• ¹ axis of symmetry	• ¹ $x = -3$
(b)	• ² turning point • ³ nature	• 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 53

	<ul style="list-style-type: none"> •² evaluation discriminant •³ solve for 1 root •⁴ complete solution 	<ul style="list-style-type: none"> •³ $x = 1.1$ •⁴ $x = -6.1$ (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 $(6)^2 - 4 \times 9 \times 1$ •² <p>#2.2 equal 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 $4 \cdot 6^2 + 6 \cdot 7^2 = 66.05$ •² $8^2 = 64$ <p>#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.</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 ZWX or angle ZYX = 90° •² $360 - (90 + 90 + 139)$ •³ 41°
15	<ul style="list-style-type: none"> •¹ use volume scale factor •² correct answer 	<ul style="list-style-type: none"> •¹ $(9/21)^3 \times 50$ •² 4 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 $360/10 = 36^\circ$ each</p> <ul style="list-style-type: none"> •¹ 144°
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 $-3/3$ and 360° •² Correct graph
18	<ul style="list-style-type: none"> •¹ correct period 	<ul style="list-style-type: none"> •¹ 720°
19	<ul style="list-style-type: none"> •¹ solve for $\tan x^\circ$ •² solve for x •³ complete solution 	<ul style="list-style-type: none"> •¹ $\tan x^\circ = 1.4$ •² 54.5° •³ 234.5°