National 5 Mathematics

Past Papers by Topic

Contents:

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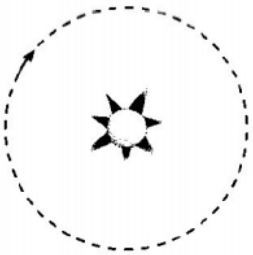
For easy navigation of the document, the contents page is linked to each chapter and the chapter headings at the top of each page are linked back to the contents page.

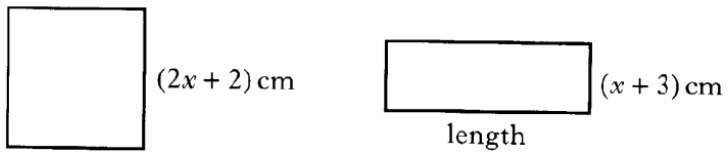
National 5: Surds and Indices

2014 P1S	**8.** Express $\sqrt{40}+4\sqrt{10}+\sqrt{90}$ as a surd in its simplest form.	3
Ans	$9\sqrt{10}$	
2014 P2	**8.** Simplify $\dfrac{n^5\times 10n}{2n^2}$.	3
Ans	$\mathbf{5}n^4$	
2015 P1	**13.** Express $\dfrac{4}{\sqrt{8}}$ with a rational denominator. Give your answer in its simplest form.	3
Ans	$\sqrt{2}$	
2015 P1	**14.** Evaluate $8^{\frac{5}{3}}$.	2
Ans	**32**	
2016 P1	**9.** The function $f(x)$ is defined by $f(x)=\dfrac{2}{\sqrt{x}}, \quad x>0$. Express $f(5)$ as a fraction with a rational denominator.	2
Ans	$\dfrac{2\sqrt{5}}{5}$	
2016 P2	**10.** Simplify $\left(n^2\right)^3\times n^{-10}$. Give your answer with a **positive** power.	3
Ans	$\dfrac{1}{n^4}$	
2017 P2	**12.** Express $\dfrac{1}{\sqrt[3]{x}}$ in the form x^n.	2
Ans	$x^{-\frac{1}{3}}$	
PP A P1	13. (a) Express $\dfrac{3}{x}-\dfrac{5}{x+2}, x\neq 0, x\neq 2,$ as a single fraction in its simplest form. (b) Express $\sqrt{18}-\sqrt{2}+\sqrt{72}$ as a surd in its simplest form.	3 3

Ans	13a. $\frac{6-2x}{x(x+2)}$ b. $8\sqrt{2}$	
PP A P2	**8. (a) Express $a^2\left(2a^{-\frac{1}{2}}+a\right)$ in its simplest form.**	2
Ans	8a. $2a^{\frac{3}{2}}+a^3$	
PP B P1	12. Express in its simplest form $y^8 \times (y^3)^{-2}$	2
Ans	y^2	
PP B P1	**14. (a) Express $\sqrt{45}-2\sqrt{5}$ as a surd in its simplest form.**	2
Ans	$\sqrt{5}$	
PP C P1	11. (a) Evaluate $8^{\frac{2}{3}}$	2
	(b) Simplify $\frac{\sqrt{24}}{\sqrt{2}}$	2
	(c) Simplify $\frac{2x+2}{(x+1)^2}$	2
Ans	a 4 b $2\sqrt{3}$ c $\frac{2}{x+1}$	
PP D P1	**10. Evaluate 2^0+3^{-1}.**	2
Ans	4/3	
PP D P1	11. Express $\sqrt{12}+5\sqrt{3}-\sqrt{27}$ as a surd in its simplest form.	3
Ans	$4\sqrt{3}$	
PP E P1	9. $f(x)=4\sqrt{x}+\sqrt{2}$	
	(a) Find the value of $f(72)$ as a surd in its simplest form.	3
	(b) Find the value of t, given that $f(t)=3\sqrt{2}$.	3
Ans	(a) $25\sqrt{2}$ (b) t = 1/2	

2018 SP P2	**2.** There are 3×10^5 platelets per millilitre of blood. On average, a person has 5·5 litres of blood. On average, how many platelets does a person have in their blood? Give your answer in scientific notation.	2
Ans	1.5×10^9	
2015 P2	6. (a) The Earth is approximately spherical with a radius of 6400 kilometres. Calculate the volume of the Earth giving your answer in scientific notation, correct to 2 significant figures.  (b) The approximate volume of the Moon is $2{\cdot}2 \times 10^{10}$ cubic kilometres. Calculate how many times the Earth's volume is greater than the Moon's.	3 2
Ans	(a) $1{\cdot}1 \times 10^{12}\,\text{km}^3$ (b) **50 times bigger**	
2016 P2	**2.** A pollen sample weighs 12 grams and contains $1{\cdot}5 \times 10^9$ pollen grains.  Calculate the weight of **one** pollen grain in grams. Give your answer in scientific notation.	2
Ans	8×10^{-9}	
PP B P2	1. A spider weighs approximately 19.06×10^{-5} kilograms. A humming bird is 18 times heavier. Calculate the weight of the humming bird. Give your answer in scientific notation.	2

Ans	3.431×10^{-3} kilograms	
PP E P2	1. $E = mc^2$. Find the value of E when $m = 3.6 \times 10^{-2}$ and $c = 3 \times 10^8$. Give your answer **in scientific notation.**	3
Ans	3.24×10^{15}	
PP F P1	1. The orbit of a planet around a star is circular. The radius of the orbit is 4.96×10^7 kilometres. Calculate the circumference of the orbit. Given your answer in scientific notation. 	3
Ans	3.12×10^8 kilometres	

2014 P1	**2.** Multiply out the brackets and collect like terms: $(2x-5)(3x+1)$.	2
Ans	$6x^2-13x-5$	
2015 P1	**4.** Multiply out the brackets and collect like terms $(x-4)(x^2+x-2)$.	3
Ans	x^3-3x^2-6x+8	
2017 P1	**4.** Expand and simplify $(2x+3)(x^2-4x+1)$.	3
Ans	$2x^3-5x^2-10x+3$	
PP A P1	12. The square and rectangle shown below have the same perimeter.  Show that the length of the rectangle is $(3x+1)$ centimetres.	2
Ans	P(rectangle) = P(square) $2l+2(x+3)=4(2x+2)$ $l+x+3=2(2x+2)$ $l=4x+4-x-3$ $l=3x+1$ as required	
PP A P1	**3.** Multiply out the brackets and collect like terms. $(x+4)(2x^2+3x-1)$	3
Ans	$2x^3+11x^2+11x-4$	
PP B P1	**9.** Multiply out the brackets and collect like terms. $(x-3)(x^2+4x-1)$	3
Ans	$x^3+x^2-13x+3$	
PP C P1	**3.** Simplify $3(2x-4)-4(3x+1)$	3
Ans	$-6x-16$	

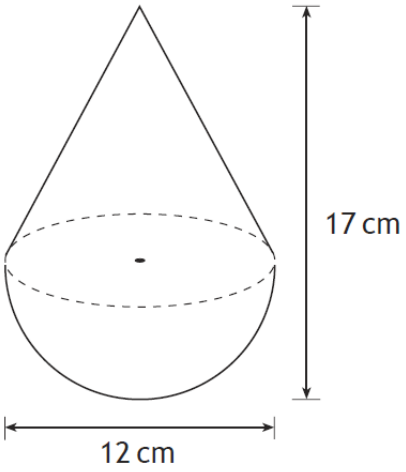
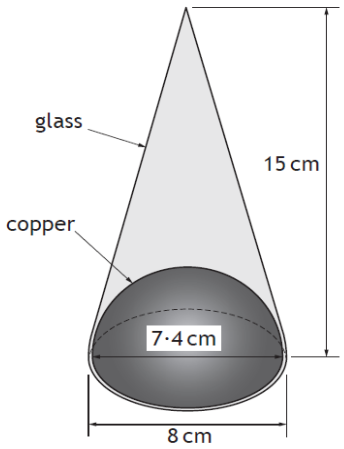
PP E P1	2. Multiply out the brackets and collect like terms. $(4x + 2)(x - 5) + 3x$	3
Ans	$4x^2 - 15x - 10$	
2016 P2	4. Factorise fully $3x^2 - 48$.	2
Ans	$3(x+4)(x-4)$	
2017 P2	9. (a) Factorise $4x^2 - 25$. (b) Hence simplify $\frac{4x^2-25}{2x^2-x-10}$.	1 3
Ans	(a) $(2x+5)(2x-5)$ (b) $\frac{2x+5}{x+2}$	
PP A P1	2. Factorise $x^2 + 2x - 15$.	2
Ans	$(x + 5)(x - 3)$	
PP B P1	6. (a) Factorise $p^2 - 4q^2$. (b) Hence simplify $\frac{p^2-4q^2}{3p+6q}$.	1 2
Ans	6a. $(p + 2q)(p - 2q)$ b. $\frac{p-2q}{3}$	
PP C P1	5. Solve, by factorising $7 + 6x - x^2 = 0$.	3
Ans	$x = 7, x = -1$	
PP F P1	2. (a) Factorise $4x^2 - y^2$. (b) Hence simplify $\frac{4x^2-y^2}{6x+3y}$.	1 2
Ans	(a) $(2x + y)(2x - y)$ (b) $\frac{2x-y}{3}$	

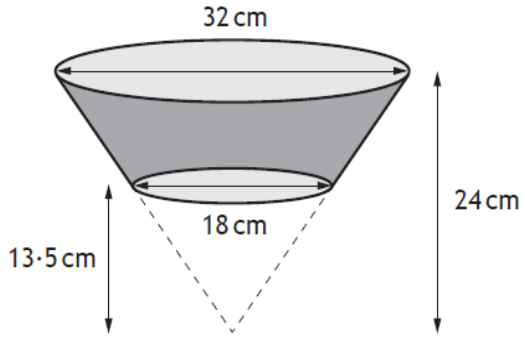
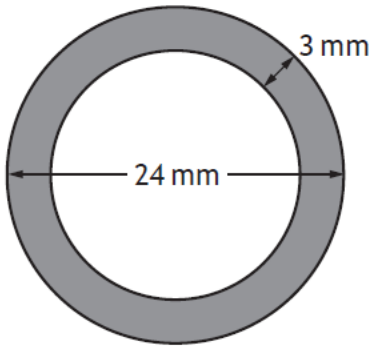
National 5: Algebra (Completing the Square)

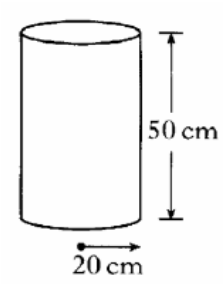
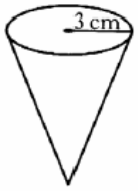
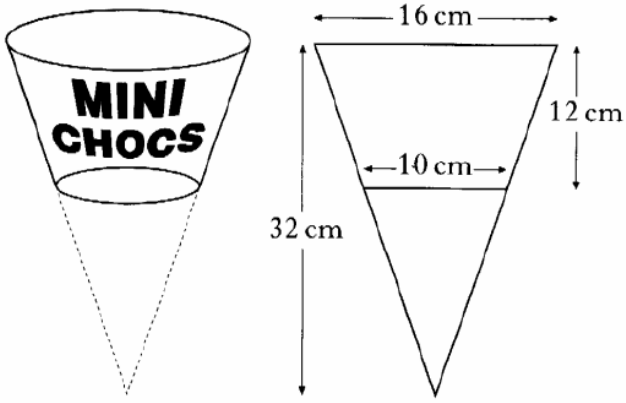
2018 SP P1	**13.** A parabola has equation $y = x^2 - 8x + 19$. (a) Write the equation in the form $y = (x-p)^2 + q$.	2
Ans	(a) $y = (x-4)^2 + 3$	
2014 P1	**3.** Express $x^2 - 14x + 44$ in the form $(x-a)^2 + b$.	2
Ans	$(x-7)^2 - 5$	
2016 P2	**9.** Express $x^2 + 8x - 7$ in the form $(x+a)^2 + b$.	2
Ans	$(x+4)^2 - 23$	
PP A P1	**4.** Express $y = x^2 + 8x - 7$ in the form $y = (x+a)^2 + b$ and hence state the coordinates of the turning point.	3
Ans	$y = (x+4)^2 - 23$, T.P.$(-4, -23)$	
PP C P1	9. $f(x) = x^2 + 6x - 7$ (a) Write $f(x)$ in the form $(x+a)^2 + b$. (b) State the coordinates of the turning point of $f(x)$.	2 1
Ans	a $f(x) = (x+3)^2 - 16$ b (-3, -16)	

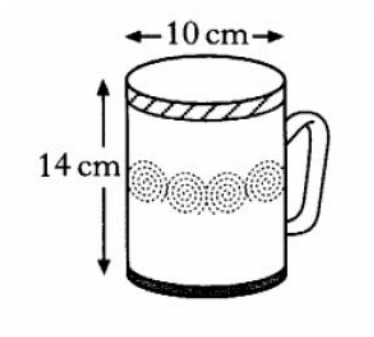
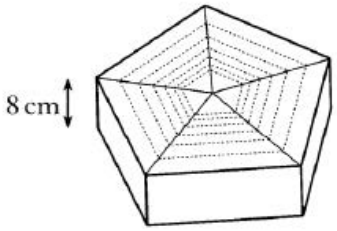
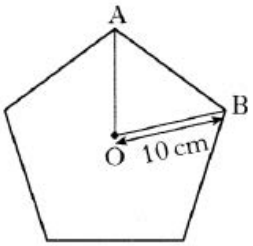
2018 SP P1	**14.** Express $\frac{4}{x+2} - \frac{3}{x-4}, \quad x \neq -2, x \neq 4$ as a single fraction in its simplest form.	3
Ans	$\frac{x-22}{(x+2)(x-4)}$	
2014 P2	**9.** Express $\frac{7}{x+5} - \frac{3}{x}$ $x \neq -5,\ x \neq 0$ as a single fraction in its simplest form.	3
Ans	$\frac{4x-15}{x(x+5)}$	
2015 P1	**12.** Simplify $\frac{x^2-4x}{x^2+x-20}$.	3
Ans	$\frac{x}{x+5}$	
2015 P2	**7.** Express $\frac{5t}{s} \div \frac{t}{2s^2}$ in its simplest form.	3
Ans	10s	
2016 P2	**13.** Express $\frac{3}{x-2} + \frac{5}{x+1}, \quad x \neq 2, x \neq -1$ as a single fraction in its simplest form.	3
Ans	$\frac{8x-7}{(x-2)(x+1)}$	
2017 P1	**11.** Express $\frac{3}{a^2} - \frac{2}{a}$, $a \neq 0$, as a single fraction in its simplest form.	2
Ans	$\frac{3-2a}{a^2}$	
PP B P1	**14.** (b) Express as a fraction in its simplest form $\frac{1}{x^2} + \frac{1}{x}, \quad x \neq 0$	2

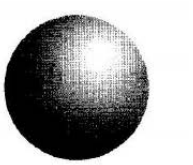
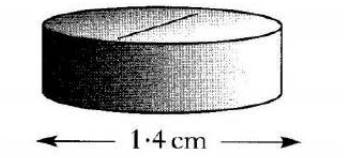
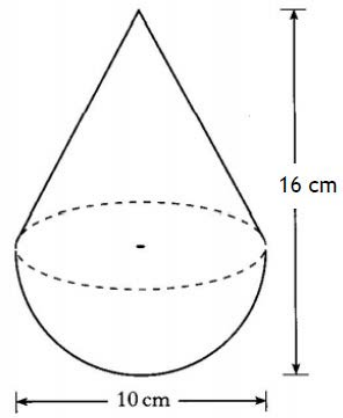
Ans	$\frac{1+x}{x^2}$	
PP C P2	12. (a) A driver travels from A to B, a distance of x kilometres, at a constant speed of 75 kilometres per hour. Find the time taken for this journey in terms of x. (b) The time taken for the journey from B to A is $\frac{x}{50}$ hours. Calculate the average speed for the whole journey.	1 4
Ans	a $\frac{x}{75}$ b 60 km/h	
PP D P1	**8. Write $\frac{3}{m}+\frac{4}{(m+1)}$ as a single fraction in its simplest form.**	3
Ans	$\frac{7m+3}{m(m+1)}$	
PP D P2	**Q10. Express $\frac{4}{x+3}+\frac{3}{x}$, $x \neq -3, x \neq 0$, as a fraction in its simplest form.**	3
Ans	$\frac{7x+9}{x(x+3)}$	
PP F P2	8. Express $\frac{3}{(x+1)}-\frac{1}{(x-2)}$, $x \neq -1, \quad x \neq -2$ as a single fraction in its simplest form.	3
Ans	$\frac{2x-7}{(x+1)(x-2)}$	

2018SP P2	**6.** A child's toy is in the shape of a hemisphere with a cone on top, as shown in the diagram.  The toy is 12 centimetres wide and 17 centimetres high. Calculate the volume of the toy. Give your answer correct to 2 significant figures.	5
Ans	$870cm^3$	
2014 P2	**7.** An ornament is in the shape of a cone with diameter 8 centimetres and height 15 centimetres. The bottom contains a hemisphere made of copper with diameter 7·4 centimetres. The rest is made of glass, as shown in the diagram below.  Calculate the volume of the glass part of the ornament. Give your answer correct to 2 significant figures.	5
Ans	**$150\ cm^3$**	

2016 P2	**7.** A carton is in the shape of a large cone with a small cone removed. The large cone has diameter of 32 cm and height 24 cm. The small cone has diameter of 18 cm and height 13·5 cm.  Calculate the volume of the carton. **Give your answer correct to 2 significant figures.**	5
Ans	**5300 cubic centimetres**	
2017 P2	**6.** A spherical sweet is made by coating a caramel sphere evenly with chocolate. A cross-section of the sweet is shown below.   The diameter of the sweet is 24 millimetres and the thickness of the chocolate coating is 3 millimetres. Calculate the volume of the chocolate coating. **Give your answer correct to 3 significant figures.**	5
Ans	4180mm^3	

PP A P2	6. A drinks container is in the shape of a cylinder with radius 20 centimetres and height 50 centimetres. (a) Calculate the volume of the drinks container. Give your answer in cubic centimetres, correct to two significant figures.  (b) Liquid from the full container can fill 800 cups, in the shape of cones, each of radius 3 centimetres.  What will be the height of liquid in each cup?	3 4
Ans	6a. $63\,000\ cm^3$ b. 8.4 cm	
PP B P2	5. A container to hold chocolates is in the shape of part of a cone with dimensions as shown below.  Calculate the volume of the container. Give your answer correct to one significant figure.	5
Ans	$2000\ cm^3$	

PP C P2	4. A mug is in the shape of a cylinder with diameter 10 centimetres and height 14 centimetres.  (a) Calculate the capacity of the mug. (b) 600 millilitres of coffee are poured in. Calculate the depth of the coffee in the mug.	2 3
Ans	a 1100 cm^3 b 7.64 cm (2dp)	
PP D P2	Q9. A gift box, 8 centimetres high, is prism shaped.   The uniform cross-section is a regular pentagon. Each vertex of the pentagon is 10 centimetres from the centre O. Calculate the volume of the box.	5
Ans	1902.1 cm^3 (1dp)	

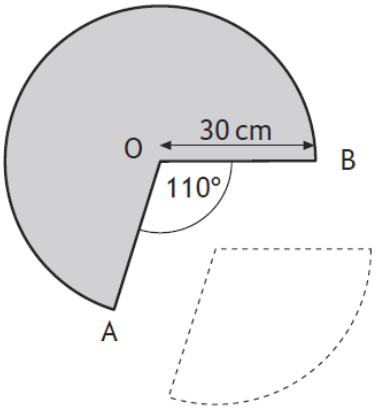
PP E P2	7. A pharmaceutical company makes vitamin pills in the shape of spheres of radius 0.5 centimetres.  (a) Calculate the volume of one pill. Give your answer **to 3 significant figures.** The company decides to change the shape of each pill to a cylinder. The new pill has the same volume as the original and its diameter is 1.4 centimetres.  (b) Calculate the height of the new pill.	3 3
Ans	0.524 cm^3 (3 SF) (b) 0.34 cm (2 decimal places)	
PP F P2	5. A child's toy is in the shape of a hemisphere with a cone on top, as shown in the diagram.  The toy is 10 centimetres wide and 16 centimetres high. Calculate the volume of the toy. Give your answer correct to two significant figures.	5
Ans	550 cubic centimetres (to 2 SF)	

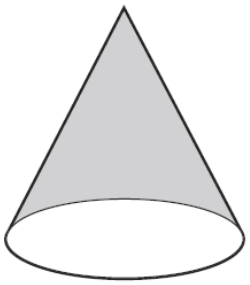
2018 SP P2

11. A cone is formed from a paper circle with a sector removed as shown.

The radius of the paper circle is 30 centimetres.

Angle AOB is 110°.





(a) Calculate the area of the sector removed from the circle. 3

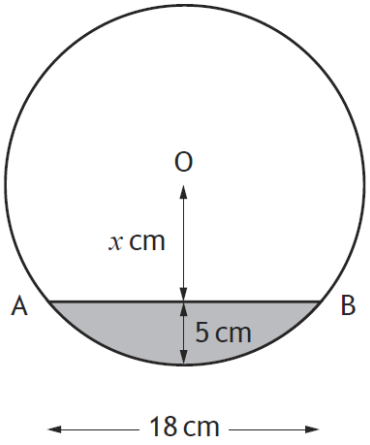
(b) Calculate the circumference of the base of the cone. 3

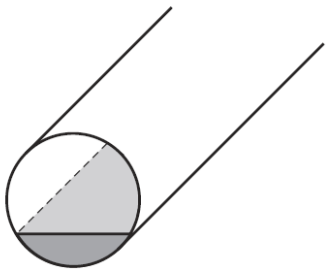
Ans

(a) 864cm^2
(b) 131cm

2018 SP P1

16. A cylindrical pipe has water in it as shown.





The depth of the water at the deepest point is 5 centimetres.

The width of the water surface, AB, is 18 centimetres.

The radius of the pipe is r centimetres.

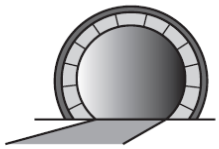
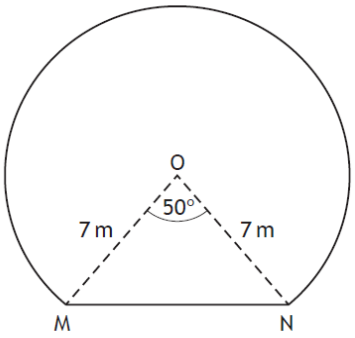
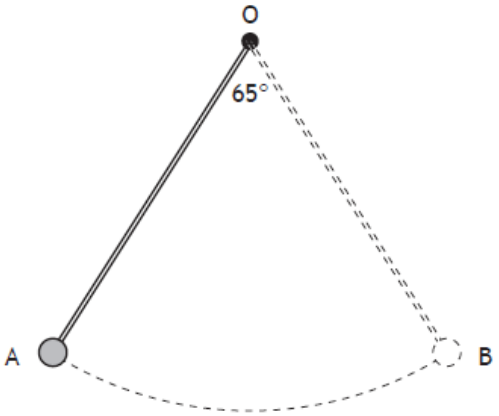
The distance from the centre, O, of the pipe to the water surface is x centimetres.

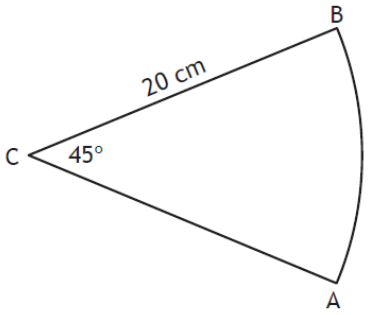
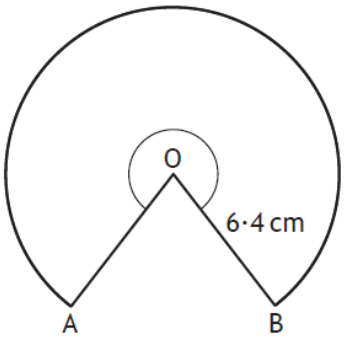
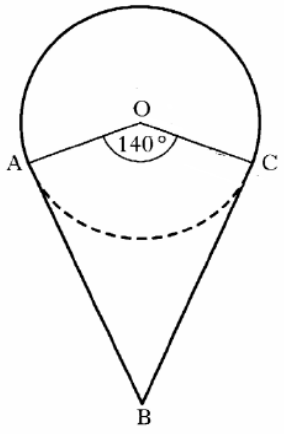
(a) Write down an expression for x in terms of r. 1

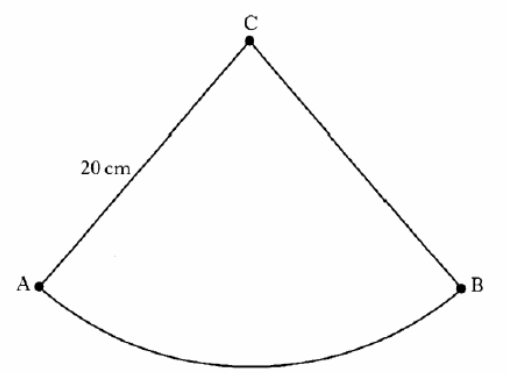
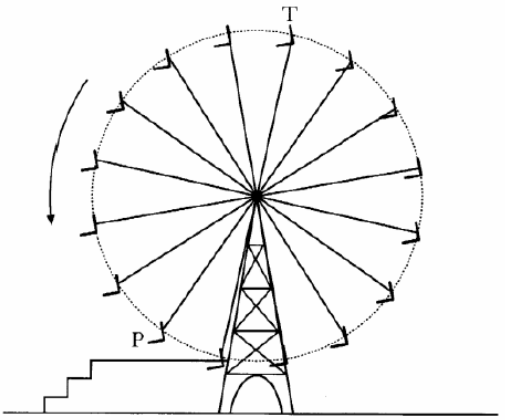
(b) Calculate r, the radius of the pipe. 3

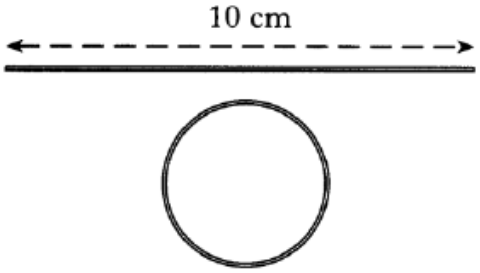
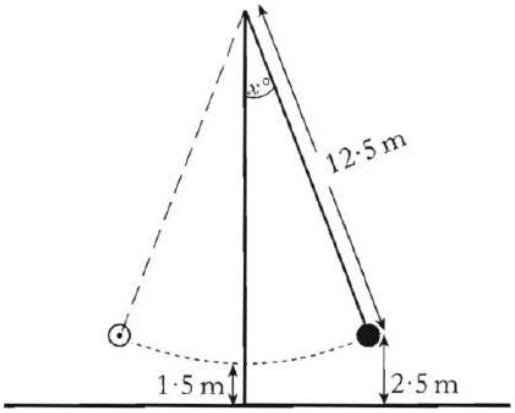
Ans

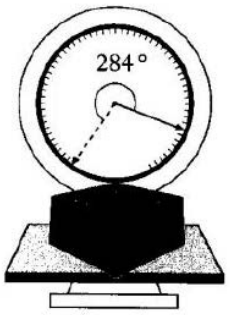
(a) r -5
(b) r = 10.6cm

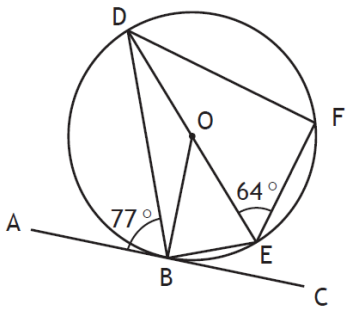
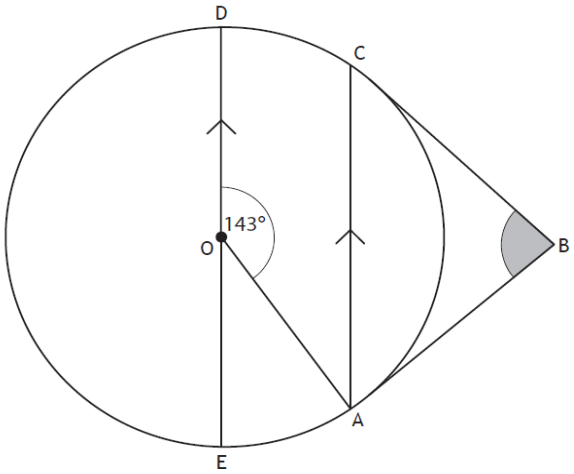
2014 P2	**13.** The picture shows the entrance to a tunnel which is in the shape of part of a circle.  The diagram below represents the cross-section of the tunnel. • The centre of the circle is O. • MN is a chord of the circle. • Angle MON is 50°. • The radius of the circle is 7 metres.  Calculate the area of the cross-section of the tunnel.	5
Ans	**151·3 m²**	
2015 P2	**10.** The pendulum of a clock swings along an arc of a circle, centre O.  The pendulum swings through an angle of 65°, travelling from A to B. The length of the arc AB is 28·4 centimetres. Calculate the length of the pendulum.	4
Ans	**25cm**	

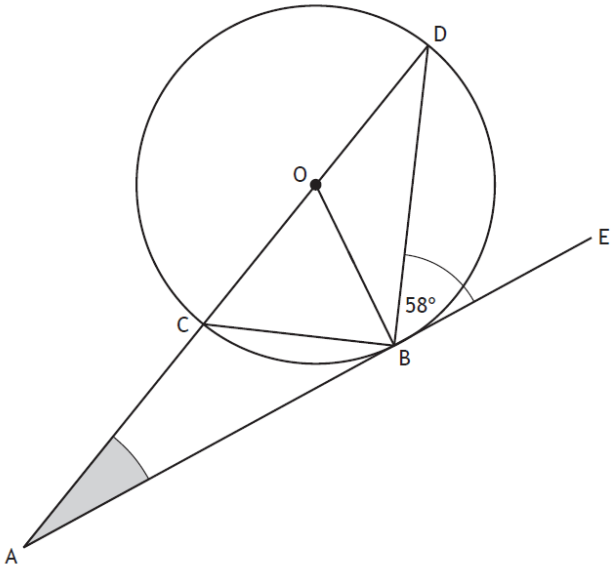
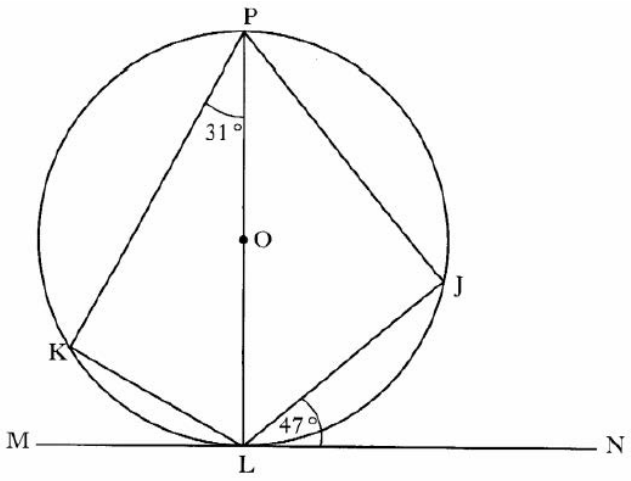
2016 P1	**3.** The diagram shows a sector of a circle, centre C.  The radius of the circle is 20 centimetres and angle ACB is 45°. Calculate the area of the sector. **Take $\pi = 3{\cdot}14$.**	3
Ans	**157 cm^2**	
2017 P2	**14.** The diagram below shows part of a circle, centre O.  The radius of the circle is 6·4 centimetres. Major arc AB has length 31·5 centimetres. Calculate the size of the reflex angle AOB.	3
Ans	282°	
PP A P2	**5.** The diagram shows a mirror which has been designed for a new hotel. The shape consists of a sector of a circle and a kite AOCB. ○ The circle, centre O, has a radius of 50 centimetres. ○ Angle AOC = 140° ○ AB and CB are tangents to the circle at A and C respectively. Find the perimeter of the mirror.  	5

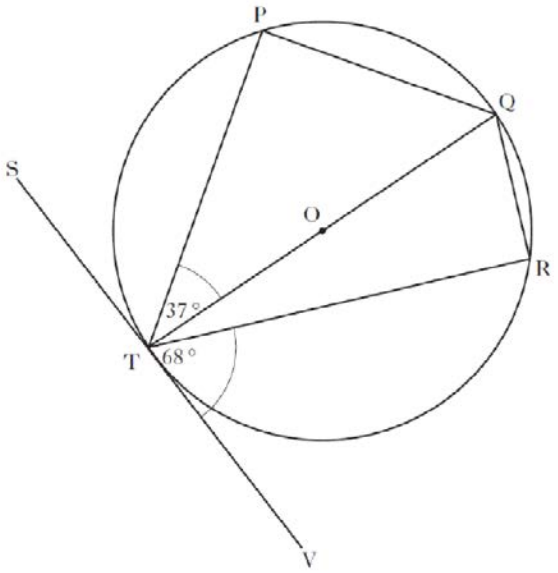
Ans	466.73 centimetres	
PP B P2	4. A pendulum travels along an arc of a circle, centre C.  The length of the pendulum is 20 centimetres. The pendulum swings from A to B. The length of the arc AB is 28.6 centimetres. Find the angle through which the pendulum swings from A to B.	4
Ans	81.9°	
PP C P2	5. The diagram below shows a big wheel at the fairground.  The wheel has 16 chairs equally spaced on its circumference. The radius of the wheel is 9 metres. As the wheel rotates in an anticlockwise direction, find the distance a chair travels in moving from position T to position P in the diagram.	4
Ans	24.74 m	

PP D P1	12. A piece of gold wire 10 centimetres long is made into a circle.  The circumference of the circle is equal to the length of the wire. Show that the area of the circle is exactly $\frac{25}{\pi}$ square centimetres.	4
Ans	Circumference $= 2\pi r = 10$, $r = \frac{10}{2\pi} = \frac{5}{\pi}$. Area $= \pi r^2 = \pi\left(\frac{5}{\pi}\right)^2 = \pi\left(\frac{25}{\pi^2}\right) = \frac{25}{\pi}$	
PP E P2	9. The chain of a demolition ball is 12.5 metres long. When vertical, the end of the chain is 1.5 metres from the ground.  It swings to a maximum height of 2.5 metres above the ground on both sides. (a) At this maximum height, show that the angle $x°$, which the chain makes with the vertical, is approximately 23°. (b) Calculate the maximum length of the arc through which the end of the chain swings. Give your answer **to 3 significant figures.**	4 4
Ans	(a) proof (b) 10.0 metres (3 SF)	

PP F P2	9. A set of scales has a circular dial. The pointer is 9 centimetres long. The tip of the pointer moves through an arc of 2 centimetres for each 100 grams of weight on the scales.  A parcel, placed on the scales, moves the pointer through an angle of 284°. Calculate the weight of the parcel.	4
Ans	2230.5 grams (to 1 decimal place)	

2015 P1	**3.**  AC is a tangent to the circle, centre O, with point of contact B. DE is a diameter of the circle and F is a point on the circumference. Angle ABD is 77° and angle DEF is 64°. Calculate the size of angle BDF.	3
Ans	39°	
2016 P2	**5.** The diagram below shows a circle, centre O.  • AB and CB are tangents to the circle. • AC and ED are parallel. • Angle AOD is 143°. Calculate the size of angle ABC.	3
Ans	74°	

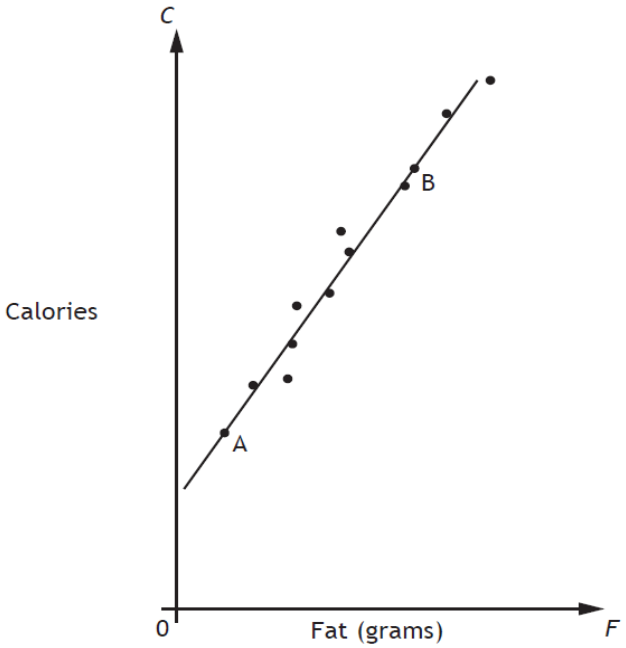
2017 P1	**9.** In the diagram shown below: • ABE is a tangent to the circle centre O • Angle DBE is 58°  Calculate the size of angle CAB.	3
Ans	26°	
PP C P2	**2.**  The tangent, MN, touches the circle, centre O, at L. Angle JLN = 47° Angle KPL = 31° Find the size of angle JLK.	3
Ans	102°	

PP F P1	9. The tangent SV touches the circle, centre O, at T. ○ Angle PTQ is 37°. ○ Angle VTR is 68°. Calculate the size of angle PQR.  	3
Ans	121°	

2014 P1

6. McGregor's Burgers sells fast food.

The graph shows the relationship between the amount of fat, F grams, and the number of calories, C, in some of their sandwiches.



A line of best fit has been drawn.

Point A represents a sandwich which has 5 grams of fat and 200 calories.

Point B represents a sandwich which has 25 grams of fat and 500 calories.

(a) Find the equation of the line of best fit in terms of F and C. 3

(b) A Super Deluxe sandwich contains 40 grams of fat.

Use your answer to part (a) to estimate the number of calories this sandwich contains. 1

Show your working.

Ans

(a) $C = 15F + 125$

(b) **725 calories**

2014 P1

11. (a) A straight line has equation $4x + 3y = 12$. 2

Find the gradient of this line.

(b) Find the coordinates of the point where this line crosses the x-axis. 2

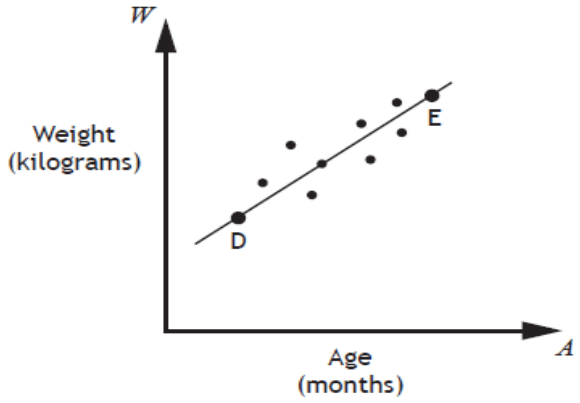
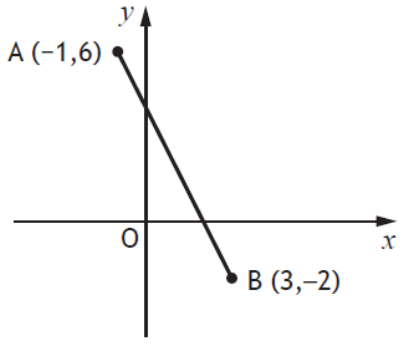
Ans

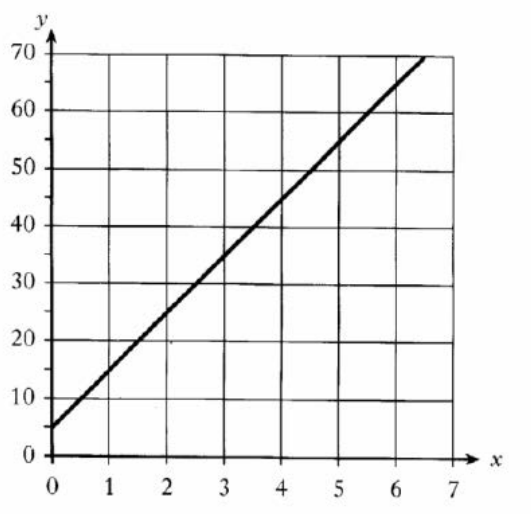
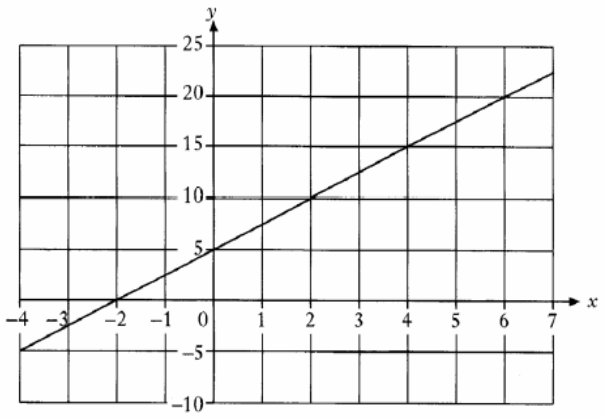
(a) $-\frac{4}{3}$ (b) (3,0)

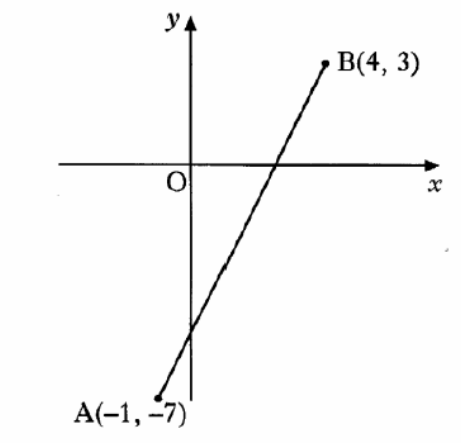
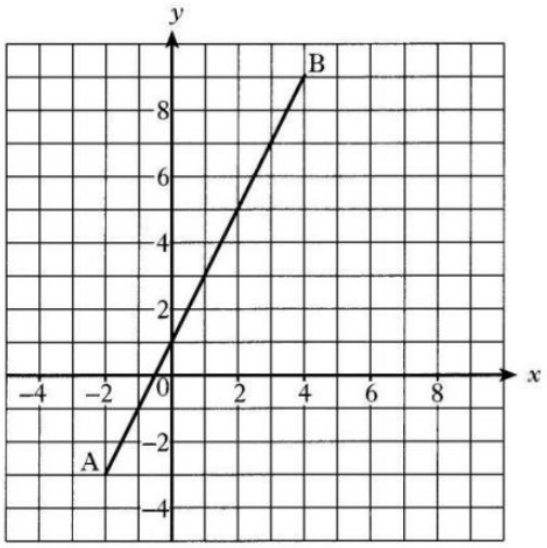
2015 P1

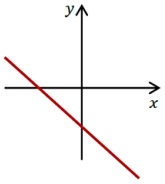
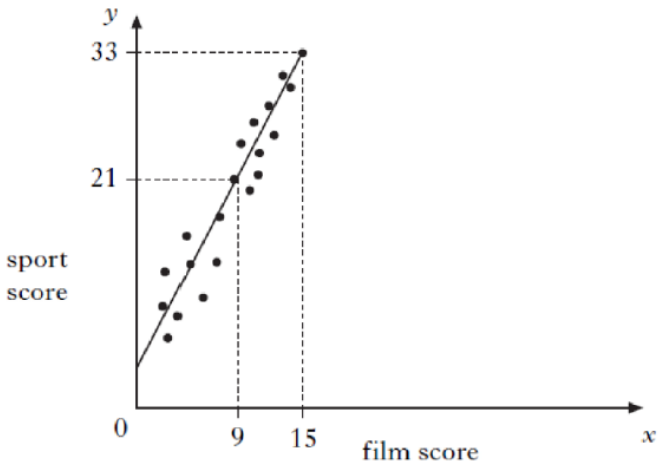
8. Find the equation of the line joining the points (−2, 5) and (3, 15). 3

Give the equation in its simplest form.

Ans	$y = 2x + 9$	
2016 P1	**5.** A cattle farmer records the weight of some of his calves. The scattergraph shows the relationship between the age, A months, and the weight, W kilograms, of the calves.  A line of best fit is drawn. Point D represents a 3 month old calf which weighs 100 kilograms. Point E represents a 15 month old calf which weighs 340 kilograms. (a) Find the equation of the line of best fit in terms of A and W. Give the equation in its simplest form. (b) Use your equation from part (a) to estimate the weight of a one year old calf. Show your working.	3 1
Ans	(a) $W = 20A + 40$ (b) $20 \times 12 + 40 = 280$ kg	
2017 P1	**6.** The diagram below shows the straight line joining points A and B.  Find the equation of the line AB. Give the equation in its simplest form.	3
Ans	$y = -2x + 4$	

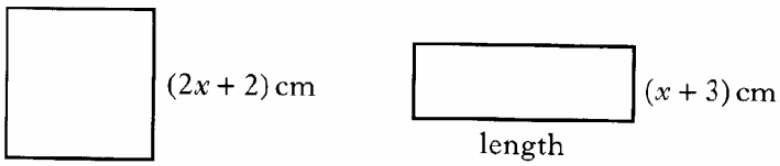
2017 P2	11. A straight line has equation $3x-5y-10=0$. Find the gradient of this line.	2
Ans	$\frac{3}{5}$ or 0·6	
PP A P1	3.  Find the equation of this straight line in the form $y=mx+c$	3
Ans	$y=10x+5$	
PP A P1	10. A straight line has the equation $3x-y=9$. A second line is parallel to this and passes throught the point $(5,-3)$. Write down the equation of the second line.	3
Ans	$y=3x-18$	
PP B P1	7.  Find the equation of the straight line shown in the diagram. Give your answer in the form $y=mx+c$.	3
Ans	$y=\frac{5}{2}x+5$	

PP C P1	8. In the diagram below, A is the point $(-1,-7)$ and B is the point $(4,3)$.  (a) Find the gradient of the line AB. (b) AB cuts the y-axis at the point $(0,-5)$. Write down the equation of the line AB. (c) The point $(3k,k)$ lies on AB. Find the value of k.	2 1 2
Ans	a $m_{AB}=2$ b $y=2x-5$ c $k=1$	
PP D P1	1. Find the gradient of the straight line joining points A(3, -7) and B(-5, 3)	2
Ans	$m_{AB}=-\frac{5}{4}$	
PP D P1	3.  Find the equation of the straight line AB.	3

Ans	$y = 2x + 1$	
PP D P1	13. Two variables x and y are connected by the relationship $y = ax + b$. Sketch a possible graph of y against x to illustrate this relationship when a and b are both less than zero.	3
Ans		
PP E P1	3. In an experiment involving two variables, the following values for x and y were recorded. x: 1, 2, 3, 4 y: 4, 2, 0, -2 The results were plotted and a straight line was drawn through the points. Find the gradient of the line **and** write down its equation.	3
Ans	$y = -2x + 6$	
PP F P1	4. Teams in a quiz answer questions on film and sport. This scatter graph shows the scores of some of the teams.  A line of best fit is drawn as shown above. (a) Find the equation of this straight line. (b) Use this equation to estimate the sport score for a team with a film score of 20.	3 1
Ans	(a) $y = 2x + 3$ (b) 43	

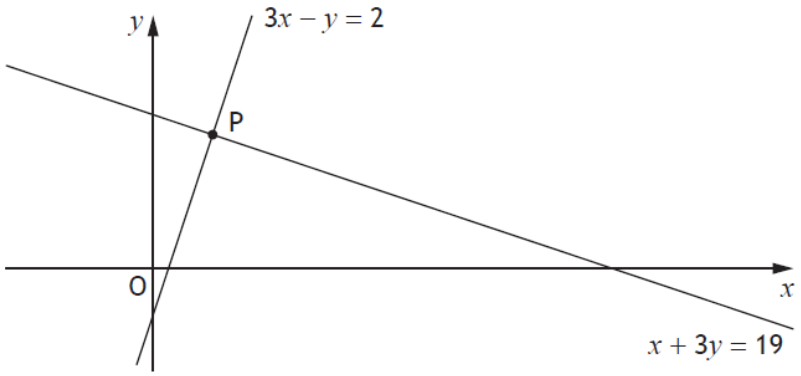
PP F P1	8. A straight line is represented by the equation $2y + x = 6$. (a) Find the gradient of this line. (b) This line crosses the y-axis at $(0, c)$. Find the value of c.	 2 1
Ans	(a) $m = -\frac{1}{2}$ (b) $c = 3$	

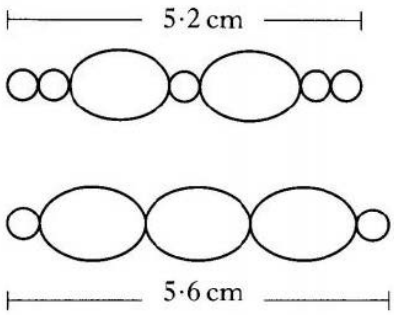
2018 SP P1	**10.** The function $f(x)$ is defined by $f(x)=\frac{2}{\sqrt{x}}, \quad x>0$. Express $f(5)$ as a fraction with a rational denominator.	2
Ans	$\frac{2\sqrt{5}}{5}$	
2015 P2	**2.** A function is defined as $f(x) = 3x + 2$. Given that $f(a) = 23$, calculate a.	2
Ans	$a = 7$	
2017 P1	**1.** Given that $f(x)=x^2+3x$, evaluate $f(-5)$.	2
Ans	10	
PP B P1	**4.** Given that $f(x) = x^2 + 5x$, evaluate $f(-3)$.	2
Ans	$f(-3) = -6$	
PP B P1	**11.** Two functions are given below. $f(x) = x^2 + 2x - 1$ $g(x) = 5x + 3$ Find the values of x for which $f(x) = g(x)$.	3
Ans	$x = 4, \ x = -1$	
PP C P1	**4.** $f(x) = 7 - 4x$ (a) Evaluate $f(-2)$. (b) Given that $f(t) = 9$, find t.	1 2
Ans	a 15 b $t = -\frac{1}{2}$	

2015 P2	**2.** Solve algebraically the inequality $11-2(1+3x)<39$	3
Ans	$x>-5$	
2016 P1	**8.** Solve the equation $\frac{2x}{3}-\frac{5}{6}=2x.$ Give your answer in its simplest form.	3
Ans	$x=-\frac{5}{8}$	
2017 P1	**8.** Solve, algebraically, the inequality $19+x>15+3(x-2).$	3
Ans	$x<5$ or $5>x$	
PP A P1	12. The square and rectangle shown below have the same perimeter.  Show that the length of the rectangle is $(3x+1)$ centimetres.	2
Ans	P(rectangle) = P(square) $2l+2(x+3)=4(2x+2)$ $l+x+3=2(2x+2)$ $l=4x+4-x-3$ $l=3x+1$ as required	
PP B P1	**3.** Solve the inequality $5-x>2(x+1)$	3
Ans	$x<1$	

PP E P1	4. Solve the equation $\frac{2}{x}+9=16$	3
Ans	$x=\frac{2}{7}$	
PP F P1	6. Solve the inequation $13+4x<18-7(2-x).$	3
Ans	$x>3$	

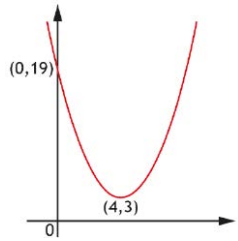
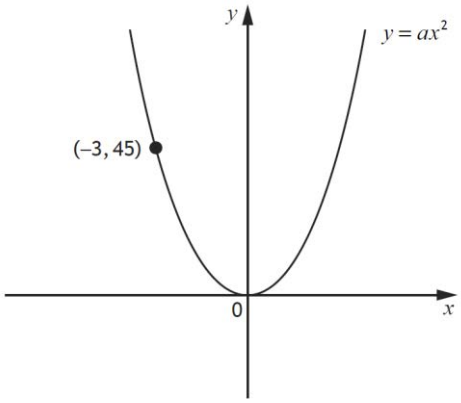
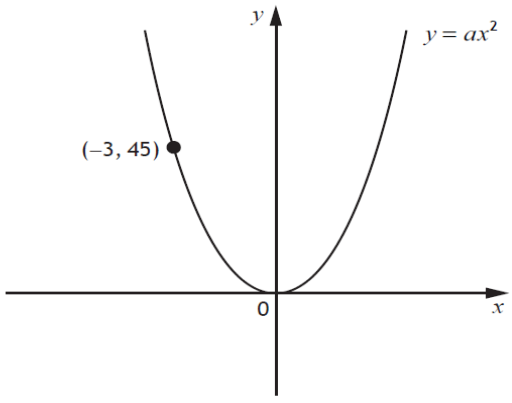
2014 P2	**3.** Two groups of people go to a theatre. Bill buys tickets for 5 adults and 3 children. The total cost of his tickets is £158·25. (a) Write down an equation to illustrate this information. (b) Ben buys tickets for 3 adults and 2 children. The total cost of his tickets is £98. Write down an equation to illustrate this information. (c) Calculate the cost of a ticket for an adult and the cost of a ticket for a child.	1 1 4
Ans	(a) $5a + 3c = 158{\cdot}25$ (b) $3a + 2c = 98$ (c) **Adult ticket costs £22·50** **Child ticket costs £15·25**	
2015 P1	**11.** Solve algebraically the system of equations $3x + 2y = 17$ $2x + 5y = 4.$	3
Ans	$x = 7, \quad y = -2$	
2016 P1	**4.** Charlie is making costumes for a school show. One day he made 2 cloaks and 3 dresses. The total amount of material he used was 9·6 square metres. (a) Write down an equation to illustrate this information. (b) The following day Charlie made 3 cloaks and 4 dresses. The total amount of material he used was 13·3 square metres. Write down an equation to illustrate this information. (c) Calculate the amount of material required to make one cloak and the amount of material required to make one dress.	1 1 4

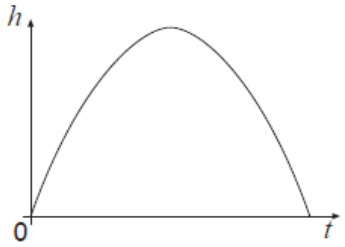
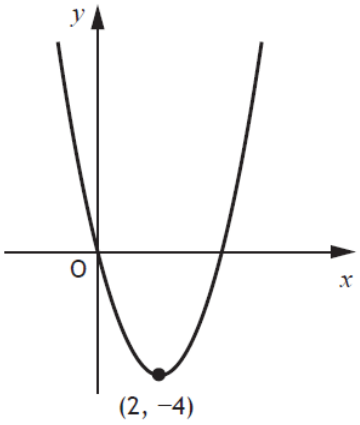
Ans	(a) $2c+3d=9{\cdot}6$ (b) $3c+4d=13{\cdot}3$ (c) A cloak requires $1{\cdot}5\ m^2$ of material A dress requires $2{\cdot}2\ m^2$ of material	
2017 P1	13. The graph below shows two straight lines with the equations: • $3x-y=2$ • $x+3y=19$  The lines intersect at the point P. Find, **algebraically**, the coordinates of P.	3
Ans	(2·5, 5·5)	
PP a P1	8. Find the point of intersection of the straight lines with equations $2x+y=5$ and $x-3y=6$.	4
Ans	$(3,-1)$	
PP C P1	10. Andrew and Daisy each book in at the Sleepwell Lodge. (a) Andrew stays for 3 nights and has breakfast on 2 mornings. His bill is £145. Write down an algebraic equation to illustrate this information. (b) Daisy stays for 5 nights and has breakfast on 3 mornings. Her bill is £240. Write down an algebraic equation to illustrate this information. (c) Find the cost of one breakfast	1 1 3

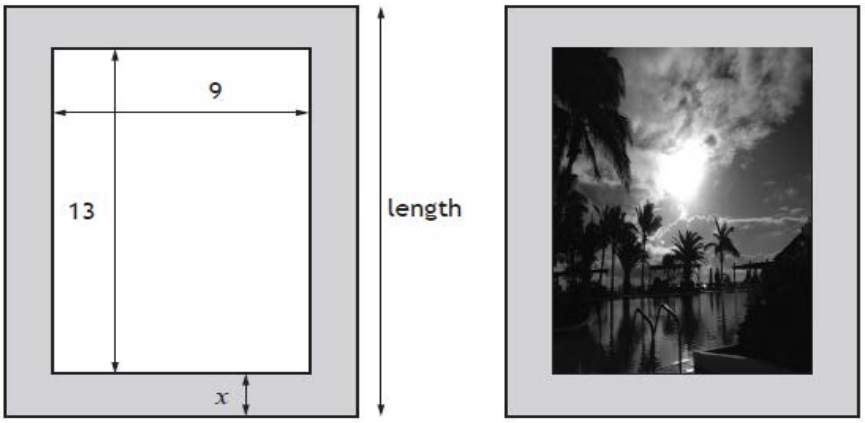
Ans	a $3n + 2b = 145$ b $5n + 3b = 240$ c One breakfast costs £5	
PP D P2	Q4. A sports centre charges different entrance fees for adults and children. (a) One evening 14 adults and 4 children visited the sports centre. The total collected in entrance fees was £55.00. Let x pounds be the adult entrance fee and y pounds be the child's entrance fee. Write down an equation in x and y to describe the above information. (b) The following evening 13 adults and 6 children visited the sports centre. The total collected in entrance fees was £54.50. Write down a second equation in x and y. (c) Calculate the entrance fee for an adult and the entrance fee for a child.	1 1 4
Ans	a $14x + 4y = 55$ b $13x + 6y = 54.5$ c Adult entrance fee £3.50. Child entrance fee £1.50.	
PP E P2	6. A jeweller uses two different arrangements of bead and pearls.  The first arrangement consists of 2 beads and 5 pearls and has an overall length of 5.2 centimetres. The second arrangement consists of 3 beads and 2 pearls and has an overall length of 5.6 centimetres. Find the length of **one** bead and the length of **one** pearl.	6

Ans	Bead 1.6 centimetres, pearl 0.4 centimetres	
PP F P2	4. Solve algebraically the system of equations $4x + 2y = 13$ $5x + 3y = 17.$	3
Ans	$x = \frac{5}{2}, y = \frac{3}{2}$ (or $x = 2.5, y = 1.5$)	

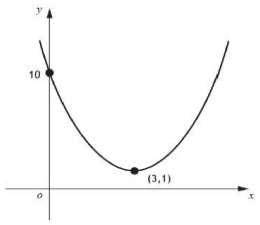
2014 P2	**11.** Change the subject of the formula $s = ut + \frac{1}{2}at^2$ to a.	3
Ans	$a = \frac{2(s-ut)}{t^2}$	
2016 P2	**12.** Change the subject of the formula $L = \sqrt{4kt - p}$ to k.	3
Ans	$k = \frac{L^2 + p}{4t}$	
2017 P1	**10.** Change the subject of the formula $F = \frac{t^2 + 4b}{c}$ to b.	3
Ans		
PP A P1	**5.** $P = R^3b - 5$ Change the subject of the formula to R.	3
Ans	$R = \sqrt[3]{\frac{P+5}{b}}$	
PP B P2	**10.** Change the subject of the formula to p. $r = 3p - 2t$	2
Ans	$p = \frac{r+2t}{3}$	
PP C P2	**3.** Change the subject of the formula $y = ax^3 + c$ to x.	3
Ans	$x = \sqrt[3]{\frac{y-c}{a}}$	
PP F P2	**3.** Change the subject of the formula below to x. $\frac{x}{c} + a = b$	2
Ans	$x = c(b - a)$ (or equivalent)	

2018 SP P1	**13.** A parabola has equation $y = x^2 - 8x + 19$. (a) Write the equation in the form $y = (x-p)^2 + q$. (b) Sketch the graph of $y = x^2 - 8x + 19$, showing the coordinates of the turning point and the point of intersection with the y-axis.	2
Ans	(a) $y = (x-4)^2 + 3$ 	
2018 SP P1	**5.** Determine the nature of the roots of the function $f(x) = 7x^2 + 5x - 1$.	2
Ans	Two real and distint roots.	
2018 SP P1	**4.** The diagram below shows part of the graph of $y = ax^2$.  Find the value of a.	2
Ans	$a = 5$	
2014 P1	**7.** The diagram below shows part of the graph of $y = ax^2$  Find the value of a.	2

Ans	$a = 5$	
2014 P1	13. The diagram below shows the path of a small rocket which is fired into the air. The height, h metres, of the rocket after t seconds is given by $h(t) = 16t - t^2$  (a) After how many seconds will the rocket first be at a height of 60 metres? (b) Will the rocket reach a height of 70 metres? Justify your answer.	4 3
Ans	**6 seconds**	
2015 P1	7. The graph below shows part of the parabola with equation of the form $y = (x + a)^2 + b.$  The minimum turning point (2, −4) is shown in the diagram. (a) State the values of (i) a (ii) b. (b) Write down the equation of the axis of symmetry of the graph.	1 1 1

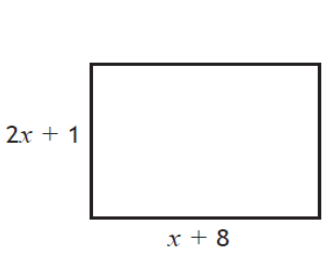
Ans	(a)(i) -2 (ii) -4 (b) x = 2	
2015 P2	**14.** A rectangular picture measuring 9 centimetres by 13 centimetres is placed on a rectangular piece of card. The area of the card is 270 square centimetres. There is a border x centimetres wide on all sides of the picture.  (a) (i) Write down an expression for the length of the card in terms of x. (ii) Hence show that $4x^2 + 44x - 153 = 0$. (b) Calculate x, the width of the border. Give your answer correct to one decimal place.	1 2 4
Ans	(a) (i) 2x = 1 (ii) proof (b) X = 2.8cm	
2016 P1	**6.** Determine the nature of the roots of the function $f(x) = 7x^2 + 5x - 1$.	2
Ans	**real and distinct**	
2016 P1	**10.** Sketch the graph of $y = (x-3)^2 + 1$. On your sketch, show clearly the coordinates of the turning point and the point of intersection with the y–axis.	3

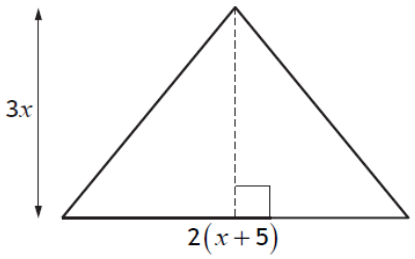
Ans



2016 P1

12. The diagrams below show a rectangle and a triangle.
All measurements are in centimetres.





(a) Find an expression for the area of the **rectangle**. 1

(b) Given that the area of the rectangle is equal to the area of the triangle, show that $x^2 - 2x - 8 = 0$. 3

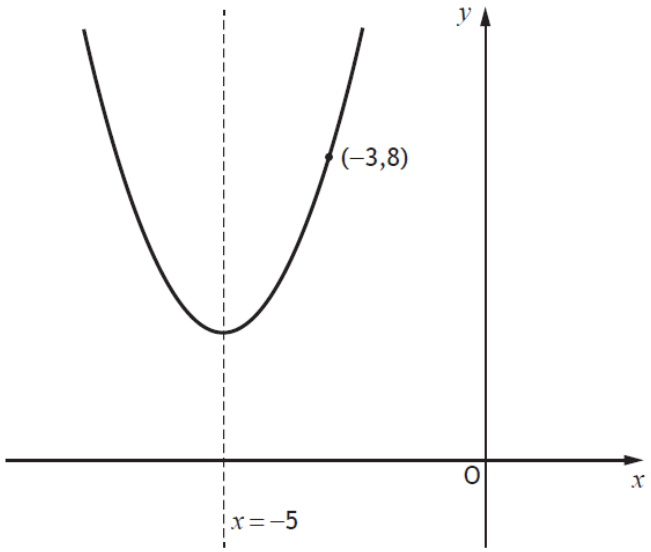
(c) Hence find, **algebraically**, the length and breadth of the rectangle. 3

Ans

(a) (2x + 1)(x + 8)
(b) Proof
(c) 2cm and 9cm

2017 P1

14. The graph below shows a parabola with equation of the form $y = (x+a)^2 + b$.

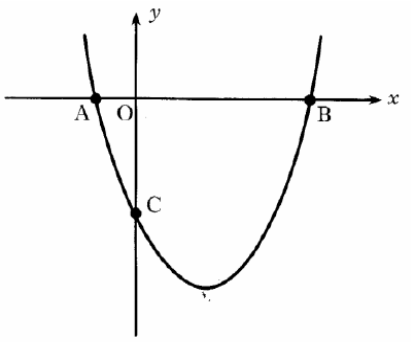


The equation of the axis of symmetry of the parabola is $x = -5$.

(a) State the value of a. 1

The point (–3,8) lies on the parabola.

(b) Calculate the value of b. 2

Ans	$a = 5$	
2017 P2	**4.** Solve the equation $2x^2 + 5x - 4 = 0$. Give your answers correct to one decimal place.	3
Ans	$x = -3{\cdot}1,\ x = 0{\cdot}6$	
PP A P1	**9.** A parabola has equation $y = x^2 - 3x + 7$. Using the discriminant, determine the nature of its roots.	3
Ans	$b^2 - 4ac = -19 < 0$ Therefore there are no real roots	
PP A P1	11.  The equation of the parabola in the diagram above is $y = (x-2)^2 - 9$. (a) State the coordinates of the minimum turning point of the parabola. (b) Find the coordinates of C. (c) A is the point $(-1, 0)$. State the coordinates of B.	2 2 1
Ans	11a. $(2, -9)$ b. $C(0, -5)$ c. $B(5,0)$	
PP A P2	**8.** (b) Use an appropriate formula to solve the quadratic equation $3x^2 + 3x - 7 = 0$. Give your answers correct to 1 decimal place.	4
Ans	b. $x = 1.1$ or -2.1	

PP A P2

10. A rectangular wall vent is 30 centimetres long and 10 centimetres wide.

It is to be enlarged by increasing both the length and the width by x centimetres.

(a) Show that the area, A square centimetres, of the new vent is given by

$$A = x^2 + 40x + 300.$$

The area of the new vent must be at least 75% more than the original area.

(b) Find the minimum dimensions of the new vent.

5

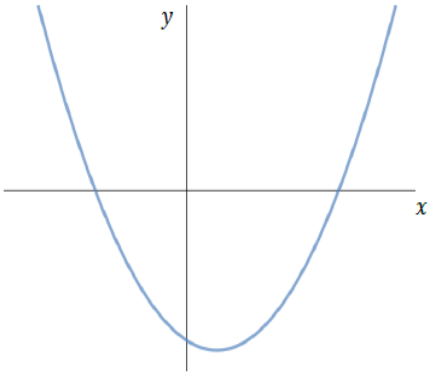
Ans

10a. Area = length × breadth $= (30+x)(10+x) = 300+30x+10x+x^2 = x^2+40x+300$.

10b. length = 35 cm, breadth = 15 cm

PP B P1

13.



The equation of the parabola in the above diagram is

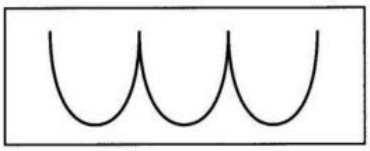
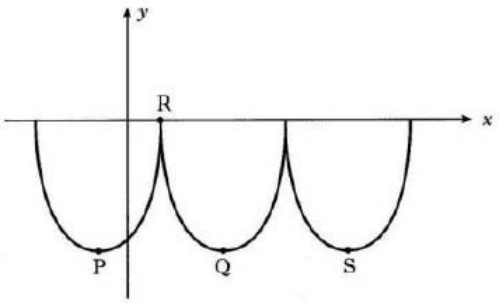
$$y = (x-1)^2 - 16.$$

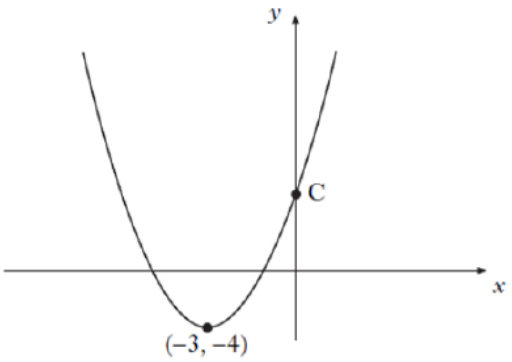
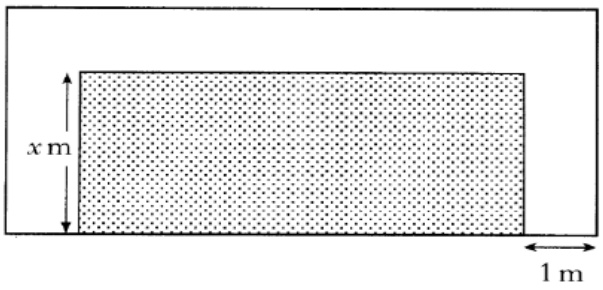
(a) State the coordinates of the minimum turning point of the parabola. 2

(b) State the equation of the axis of symmetry of the parabola. 1

Ans

13a. Min T.P. $(1, -16)$ b. $x = 1$

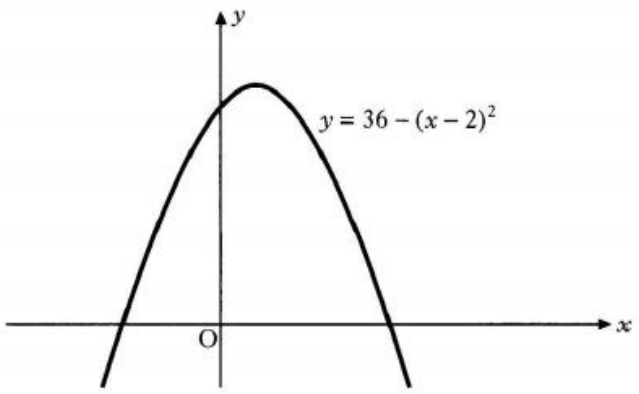
PP B P2	6. Solve the equation $2x^2 + 3x - 1 = 0$. Give your answers correct to one decimal place.	4
Ans	$x = 0.3, -1.8$	
PP C P2	6. Find the roots of the equation $2x^2 + 4x - 9 = 0$. Give your answers correct to one decimal place.	4
Ans	$x = 1.3, -3.3$	
PP C P2	8. Determine the nature of the roots of the equation $(x-2)^2 - 5x = 0$.	4
Ans	$b^2 - 4ac > 0$, therefore two real and distinct roots	
PP D P1	7. William Watson Fast Foods use a logo based on parts of three identical parabolas.  The logo is represented on the diagram below.  The first parabola has turning point P and equation $y = (x+2)^2 - 16$ (a) State the coordinates of P. (b) If R is the point (2,0), find the coordinates of Q, the minimum turning point of the second parabola. (c) Find the equation of the parabola with turning point S.	2 1 2
Ans	a P(-2, -16) b Q(6, -16) c $y = (x-14)^2 - 16$	

PP 2 P D	Q5. The diagram below shows part of a parabola with equation of the form $y = (x + a)^2 + b.$  (a) Write down the equation of the axis of symmetry of the graph. (b) Write down the equation of the parabola. (c) Find the coordinates of C.	1 2 2
Ans	a $x = -3$ b $y = (x + 3)^2 - 4$ c C(0,5)	
PP D	Q8. Find the values of k such that the equation $2x^2 - kx + 2 = 0$ has equal roots.	4
Ans	$k = \pm 4$	
PP D P2	Q11. A rectangular lawn has a path, 1 metre wide, on 3 sides as shown.  The breadth of the lawn is x metres. The length of the lawn is three times its breadth. The area of the lawn equals the area of the path. (a) Show that $3x^2 - 5x - 2 = 0.$ (b) Hence find the length of the lawn.	3 4

Ans	a Area lawn = Area path Area of lawn = Total area of garden – Area of lawn $3x \times x = (x+1)(3x+2) - 3x \times x$ $3x^2 = 3x^2 + 5x + 2 - 3x^2$ $3x^2 - 5x - 2 = 0$ b The lawn is 6 metres in length.	
PP E P1	**5.** Given $2x^2 - 2x - 1 = 0$, show that $x = \frac{1 \pm \sqrt{3}}{2}$	4
Ans	Proof (using quadratic formula)	

PP E P1

6. The diagram below shows part of the graph of $y = 36 - (x - 2)^2$.

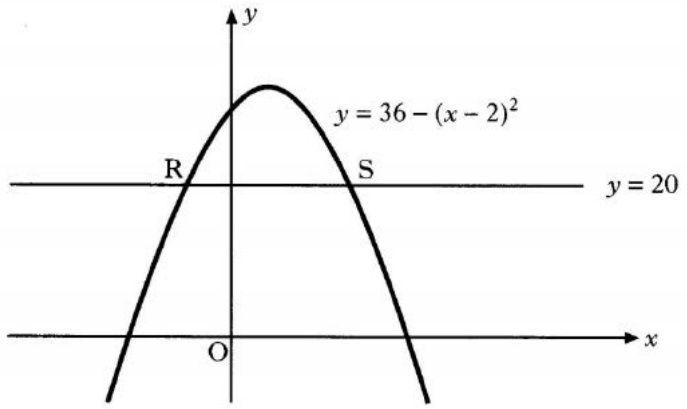


(a) State the coordinates of the maximum turning point. 2

(b) State the equation of the axis of symmetry. 1

The line $y = 20$ is drawn.

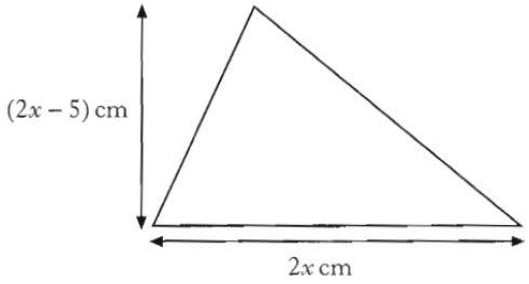
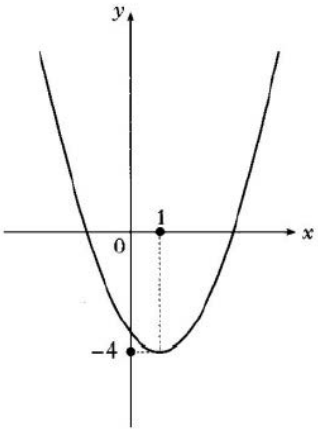
It cuts the graph of $y = 36 - (x - 2)^2$ at R and S as shown below.



(c) S is the point (6, 20). Find the coordinates of R. 2

Ans

(a) (2,36) (b) $x = 2$ (c) R(-2,20)

PP E P1	10. The height of a triangle is $(2x-5)$ centimetres and the base is $2x$ centimetres.  The area of the triangle is 7 square centimetres. Calculate the value of x.	5
Ans	$x = \frac{7}{2}$	
PP E P2	10. Find the range of values of k such that the equation $kx^2 - 4x + 2 = 0, \quad k \neq 0,$ has real roots.	4
Ans	$k \leq 2$	
PP F P1	7. The graph of $y = x^2$ has been moved to the position shown in the diagram.  Write down the equation of the graph shown.	2
Ans	$y = (x-1)^2 - 4$	

PP F P1

12. A parabola has equation $y = x^2 - 3x + 5$.

(a) Show that the parabola has no real roots. — 2

(b) Write the equation in the form $y = (x - p)^2 + q$. — 2

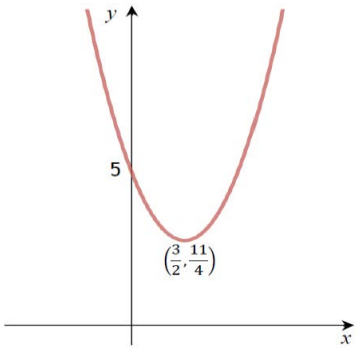
(c) Sketch the graph of $y = x^2 - 3x + 5$, showing the coordinates of the turning point and the point of intersection with the y-axis. — 3

Ans

(a) $b^2 - 4ac < 0$ therefore no real roots

(b) $y = \left(x - \frac{3}{2}\right)^2 + \frac{11}{4}$

(c)



PP F P2

10. The number of diagonals, d, in a polygon of n sides is given by the formula

$$d = \frac{1}{2}n(n-3).$$

(a) How many diagonals does a polygon of 7 sides have? — 2

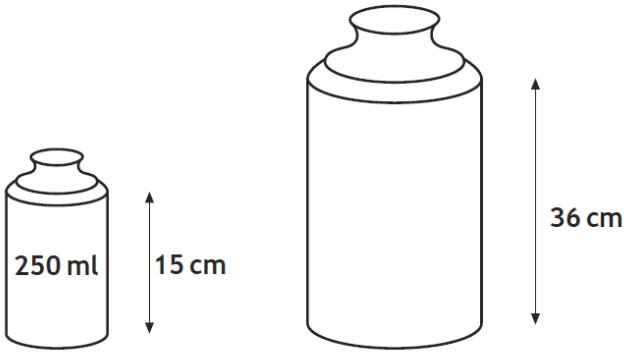
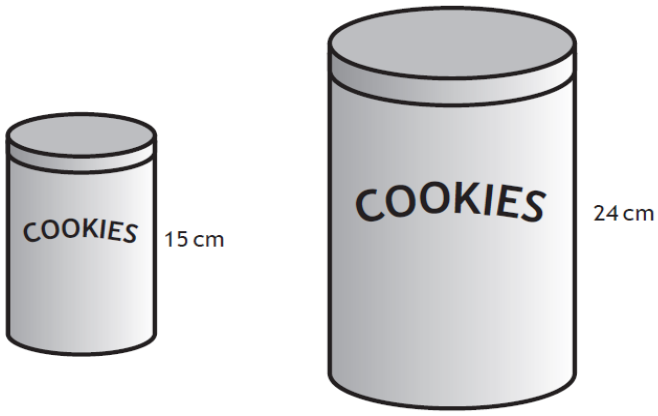
(b) A polygon has 65 diagonals.

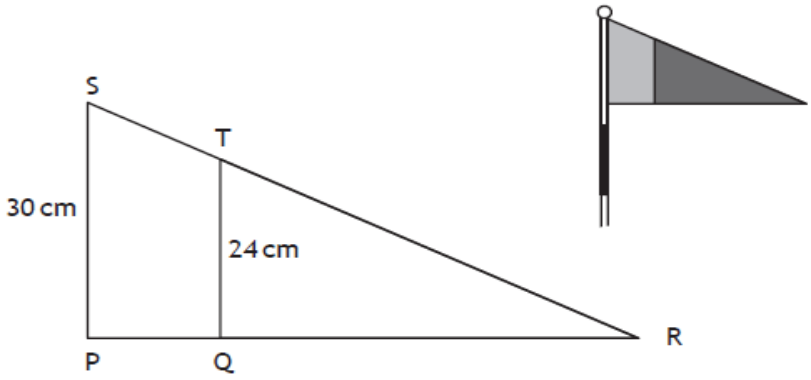
Show that for this polygon, $n^2 - 3n - 130 = 0$. — 2

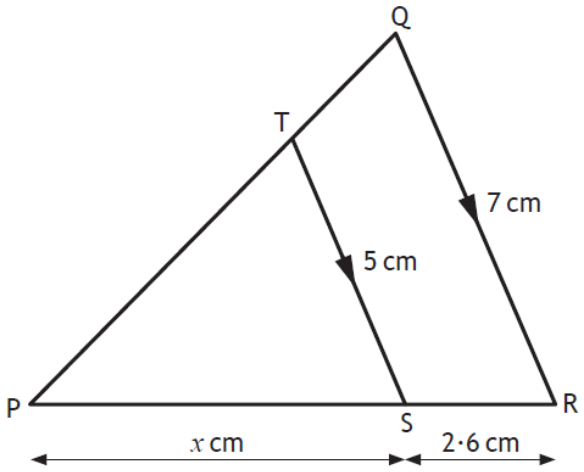
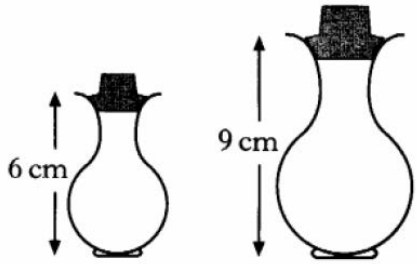
(c) Hence find the number of sides in this polygon. — 3

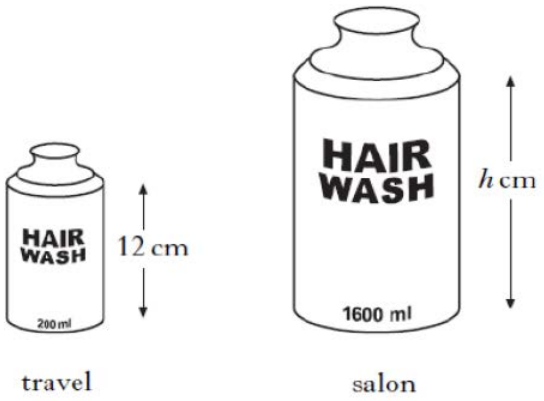
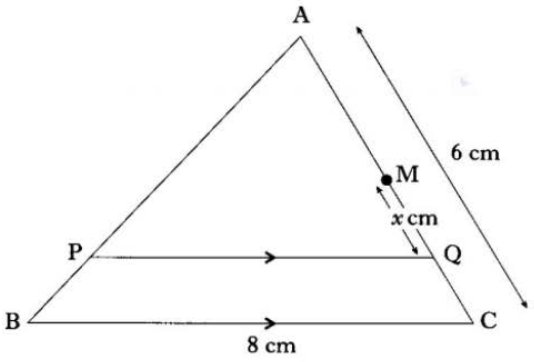
Ans

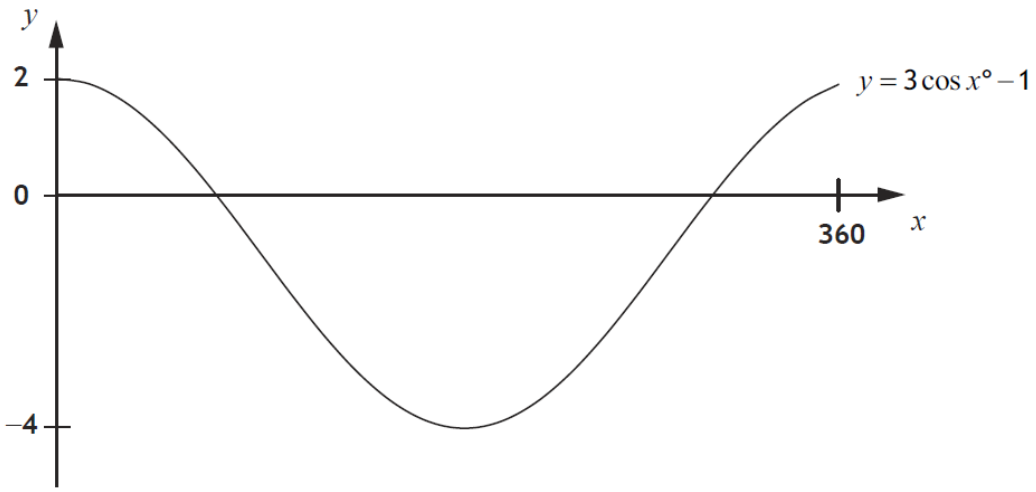
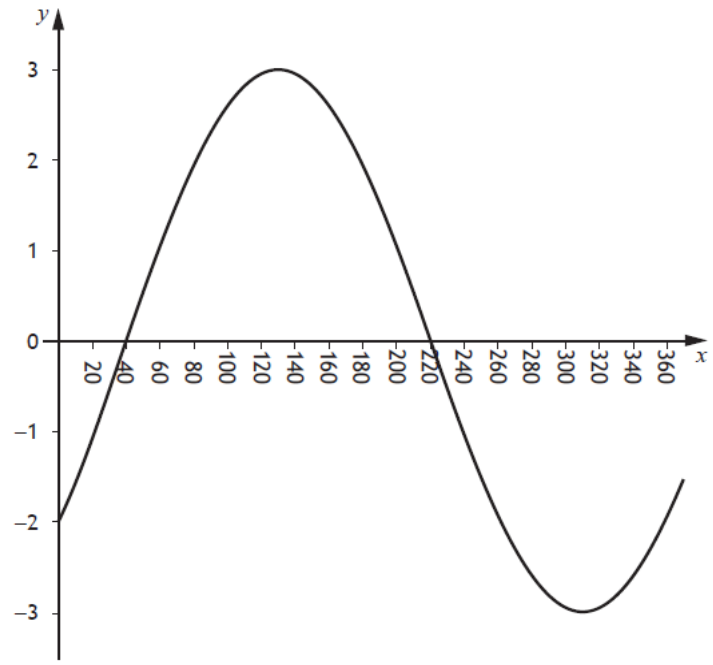
(a) 14 diagonals (b) proof (c) 13 sides

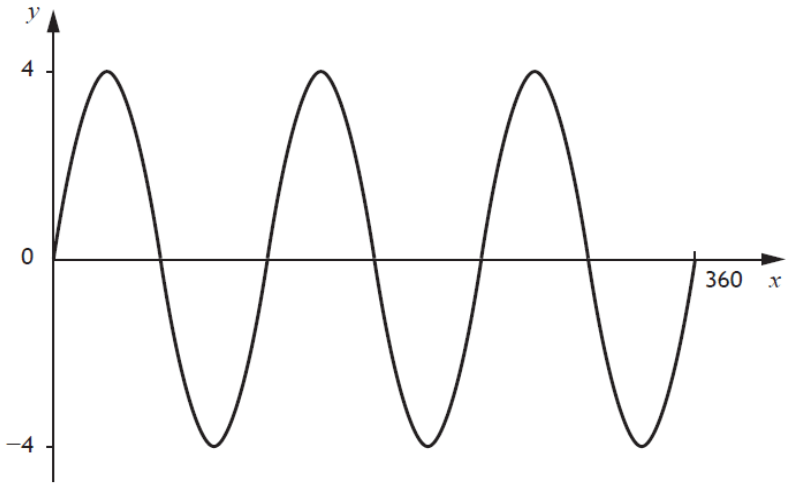
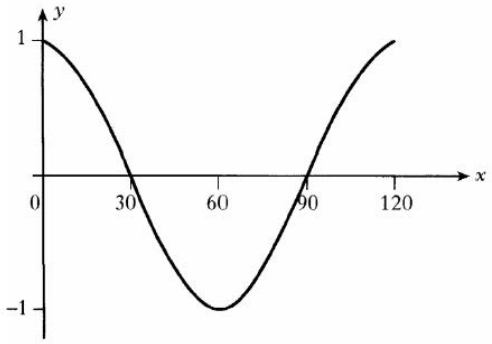
2018 SP P2	**7.** Screenwash is available in bottles which are mathematically similar.  The smaller bottle has a height of 15 centimetres and a volume of 250 millilitres. The larger bottle has a height of 36 centimetres. Calculate the volume of the larger bottle.	3
Ans	3456ml	
2014 P2	**5.** A supermarket sells cylindrical cookie jars which are mathematically similar.  The smaller jar has a height of 15 centimetres and a volume of 750 cubic centimetres. The larger jar has a height of 24 centimetres. Calculate the volume of the larger jar.	3
Ans	$3072cm^3$	

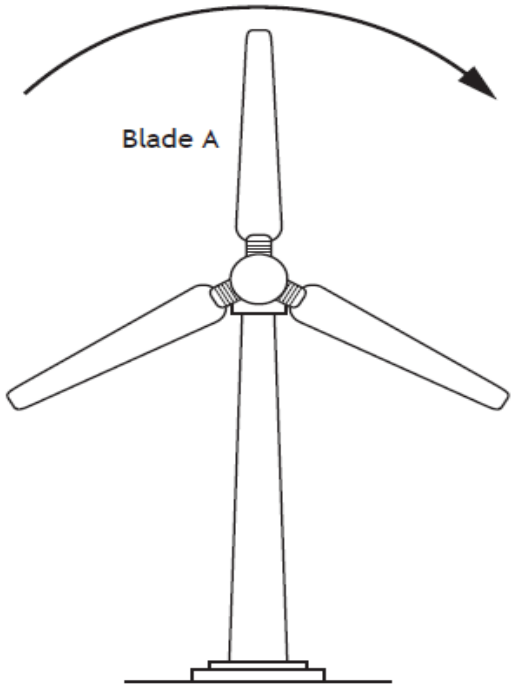
2015 P2	9. The flag at each hole on a golf course is coloured red and blue. The diagram below represents a flag. Triangle QRT represents the red section. PQTS represents the blue section.  Triangles PRS and QRT are mathematically similar. The area of triangle QRT is 400 square centimetres. Calculate the area of PQTS, the blue section of the flag.	4
Ans	$225cm^2$	
2016 P2	11. Two pictures are mathematically similar in shape.   The cost of each picture is proportional to its area. The large picture costs £13·75. Find the cost of the small picture.	3
Ans	£4·95	

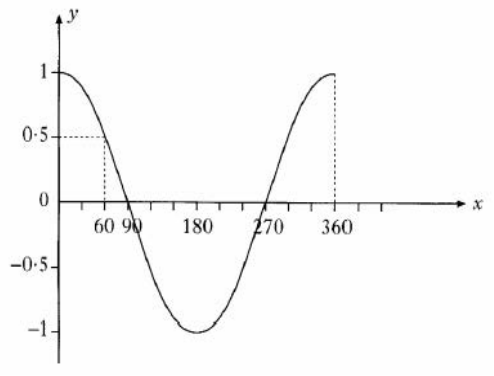
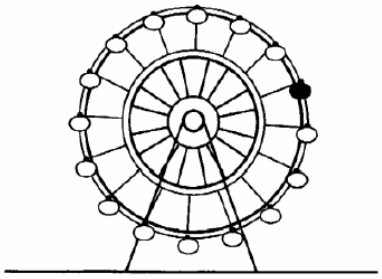
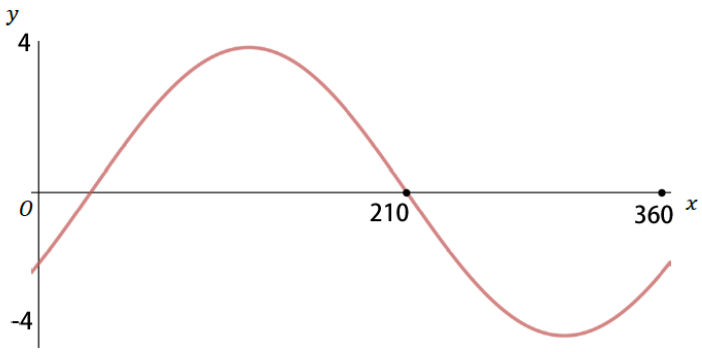
2017 P1	**15.** In the diagram below: • TS is parallel to QR • TS = 5 centimetres • QR = 7 centimetres • SR = 2·6 centimetres  The length of PS is x centimetres. Calculate the value of x.	3
Ans	6.5cm	
PP C P2	**7.** Two perfume bottles are mathematically similar in shape.  The smaller one is 6 centimetres high and holds 30 millilitres of perfume. The larger one is 9 centimetres high. What volume of perfume will the larger one hold?	3
Ans	101.25 ml	

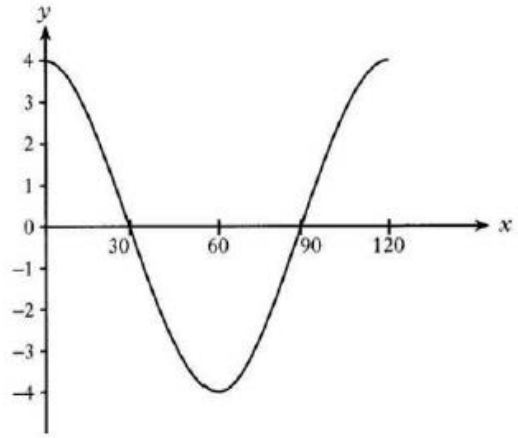
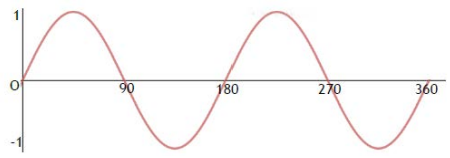
PP E P2	5. Shampoo is available in travel size and salon size bottles. The bottles are mathematically similar.  travel salon The travel size contains 200 millilitres and is 12 centimetres in height. The salon size contains 1600 millilitres. Calculate the height of the salon size bottle.	3
Ans	24 centimetres	
PP F P2	12. In triangle ABC,  ○ BC = 8 centimetres ○ AC = 6 centimetres ○ PQ is parallel to BC ○ M is the midpoint of AC. ○ Q lies on AC, x centimetres from M, as shown in the diagram. (a) Write down an expression for the length of AQ. (b) Show that PQ = $\left(4+\frac{4}{3}x\right)$ centimetres.	1 3
Ans	(a) $AQ = x + 3$ (b) $PQ = \frac{x+3}{6} \times 8 = \frac{4(x+3)}{3} = \frac{4}{3}x + 4$ as required.	

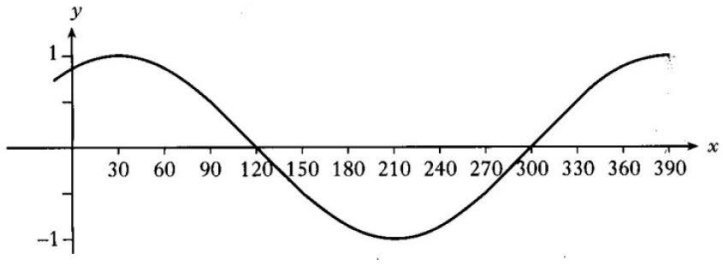
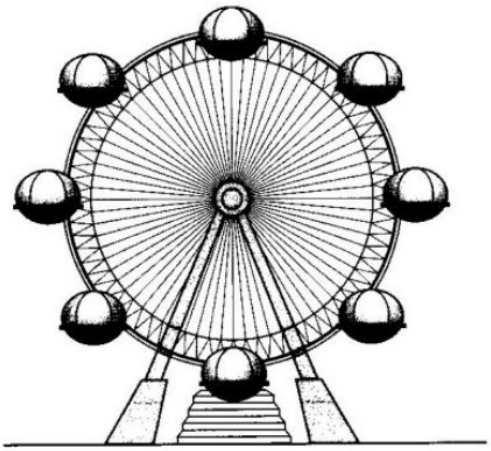
2018 SP P2	**12.** Part of the graph $y = 3\cos x° - 1$ is shown below.  Calculate the x-coordinates of the points where the graph cuts the x-axis.	4
Ans	70.5, 289.5	
2014 P1	**10.** The graph of $y = a\sin(x+b)°$, $0 \le x \le 360$, is shown below.  Write down the values of a and b.	2
Ans	$a = 3$, $b = -40$	
2014 P2	**12.** Solve the equation $11\cos x° - 2 = 3$, for $0 \le x \le 360$.	3
Ans	$x° = 63°, 297°$	

2015 P1	6. Part of the graph of $y = a\sin bx°$ is shown in the diagram.  State the values of a and b.	2
Ans	$a = 4, b = 3$	
2015 P1	9. Write the following in order of size starting with the smallest. $\cos 90°$ $\cos 100°$ $\cos 300°$ Justify your answer.	2
Ans	**cos100°, cos 90°, cos300°;** **with justification**	
2016 P2	14. Solve the equation $2\tan x° + 5 = -4$, for $0 \le x \le 360$.	3
Ans	x = **102·5, 282·5**	
PP a P1	7.  Part of the graph of $y = \cos bx°$ is shown in the diagram. State the value of b.	1

Ans	$b = 3$	
2017 P2	**15.** A wind turbine has three blades as shown below.  The height, h metres, of the tip of blade A above the ground in each rotation is given by $h = 40 + 23\cos x°, \qquad 0 \leq x < 360$ where x is the angle blade A has turned clockwise from its vertical position. (a) Calculate the height of the tip of blade A after it has turned through an angle of 60°. (b) Find the minimum height of the tip of blade A above the ground. (c) Calculate the values of x for which the tip of blade A is 61 metres above the ground.	1 1 4
Ans	51·5 metres	
PP A P2	**9.** (a) Solve the equation $4\tan x° + 5 = 0, \qquad 0 \leq x \leq 360.$	3
Ans	$x = 128.66°, 308.66°$	

PP B P1	8.  Part of the graph of $y = \cos x°$ is shown above. If $\cos 60° = 0.5$, state two values for x for which $\cos x° = -0.5$, $0 \leq x \leq 360$.	2
Ans	8. $x = 120°,\ 240°$	
PP B P2	12. At the carnival, the height, H metres, of a carriage on the big wheel above the ground is given by the formula $H = 10 + 5\sin t°$, t seconds after starting to turn.  (a) Find the height of the carriage above the ground after 10 seconds. (b) Find the two times during the first turn of the wheel when the carriage is 12.5 metres above the ground.	2 4
Ans	12a. 10.9 metres b. 30 seconds and 150 seconds	
PP C P1	7. Part of the graph of $y = a\sin(x + b)°$ is shown in the diagram.  State the values of a and b.	2

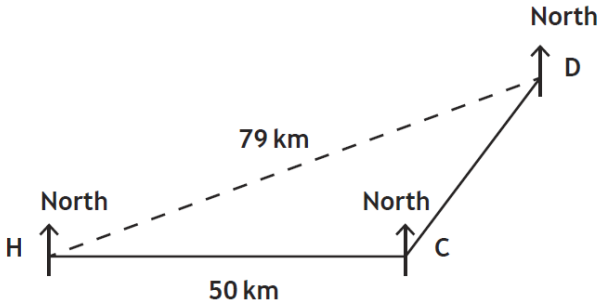
Ans	$a = 4,\ b = -30$	
PP C P2	11. (a) Solve the equation $2\tan x° + 7 = 0, \qquad 0 \le x \le 360.$	3
Ans	$x = 105.9°,\ 285.9°$	
PP D P1	9. Part of the graph of $y = a\cos bx°$ is shown in the diagram.  State the values of a and b.	2
Ans	a = 4, b = 3	
PP D P2	Q3. Solve algebraically the equation $4\sin x° + 1 = -2 \qquad 0 \le x < 360.$	3
Ans	$x = 228.6°, 311.4°$	
PP E P1	8. Sketch the graph of $y = \sin 2x°,\quad 0 \le x \le 360.$	3
Ans	Q8.  	
PP E P2	11. (a) Solve algebraically the equation $\sqrt{3}\sin x° - 1 = 0 \qquad 0 \le x < 360.$	3
Ans	a $x = 35.3°, 144.7°$ (1 decimal place)	

PP F P1	10. The graph shown below has an equation of the form $y = \cos(x - a)°$.  Write down the value of a.	1
Ans	$a = 30$	
PP F P2	11. Emma goes on the "Big Eye".  Her height, h metres, above the ground is given by the formula $$h = -31\cos t° + 33$$ where t is the number of seconds since the start. (a) Calculate Emma's height above the ground 20 seconds after the start. (b) When will Emma first reach a height of 60 metres above the ground? (c) When will she next be at a height of 60 metres above the ground?	2 3 1
Ans	(a) 3.87 metres (1 decimal place) (b) 150.6 seconds (c) 209.4 seconds	

2016 P1	**11.** Simplify $\tan^2 x° \cos^2 x°$. **Show your working.**	2
Ans	$\sin^2 x°$	
PP A P2	9. (b) Show that $\tan x \cos x = \sin x.$	2
Ans	b. Proof using $\tan x = \frac{\sin x}{\cos x}$	
PP C P2	(b) Prove that 11. $\sin^3 x + \sin x \cos^2 x = \sin x.$	3
Ans	b $\sin^3 x + \sin x \cos^2 x = \sin x\left(\sin^2 x + \cos^2 x\right) = \sin x$ (Since $\sin^2 x + \cos^2 x = 1$)	
PP E P2	Simplify Q11. $\tan x° \cos x°.$	2
Ans	Proof using the fact that $\tan x = \frac{\sin x}{\cos x}$	

2018 SP P2

15. A yacht sails from a harbour H to a point C, then to a point D as shown below.



C is 50 kilometres due east of H.

D is on a bearing of 040° from C and is 79 kilometres from H.

(a) Calculate the size of angle CDH. 4

(b) Hence, calculate the bearing on which the yacht must sail to return directly to the harbour. 2

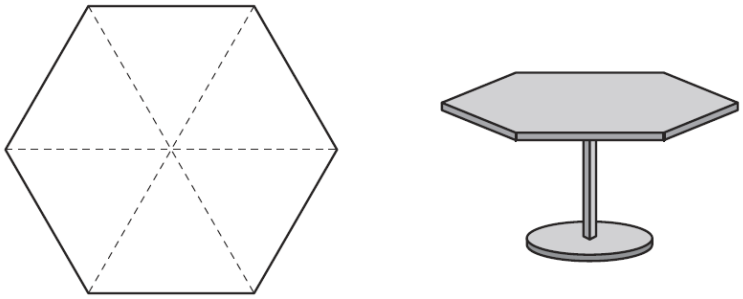
Ans

(a) 29°
(b) 249°

2015 P2

10. The top of a table is in the shape of a regular hexagon. 4

The three diagonals of the hexagon, which are shown as dotted lines in the diagram below, each have length 40 centimetres.



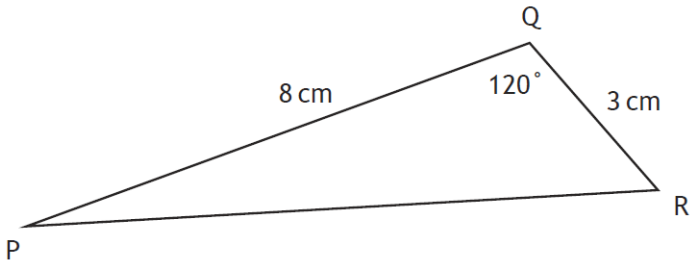
Calculate the area of the top of the table.

Ans

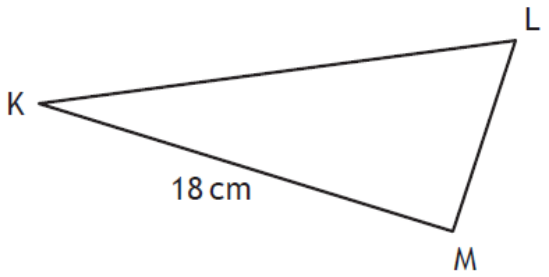
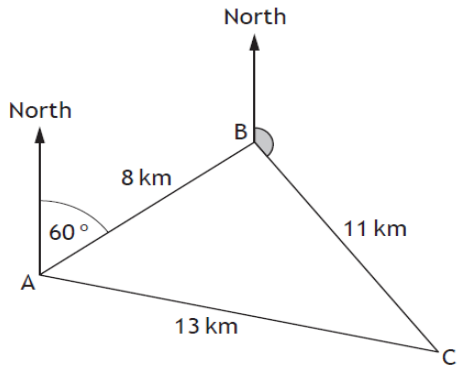
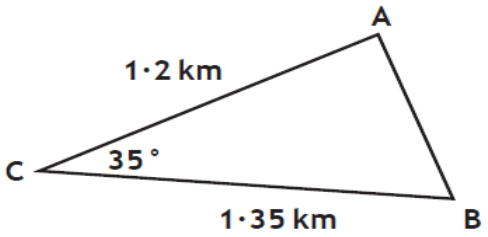
1039·2 cm²

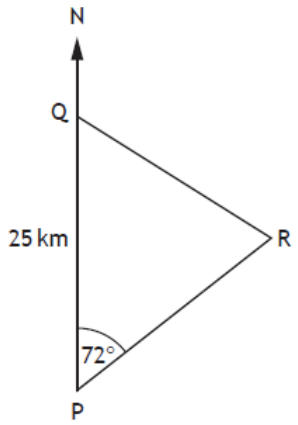
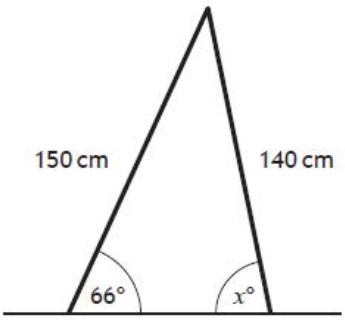
2018 SP P2

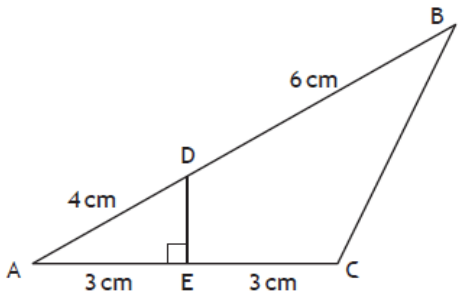
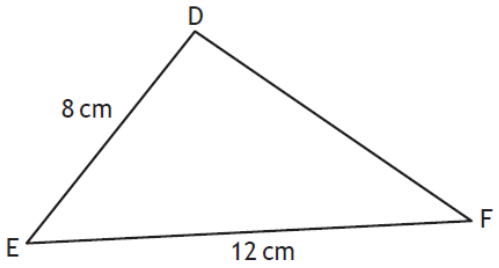
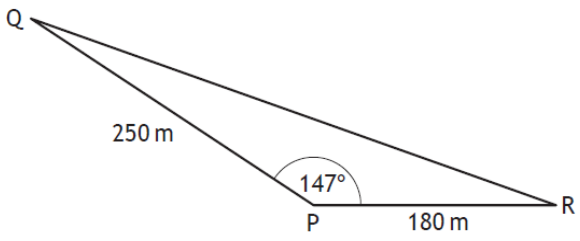
5. In triangle PQR, PQ = 8 centimetres, QR = 3 centimetres and angle PQR = 120°.

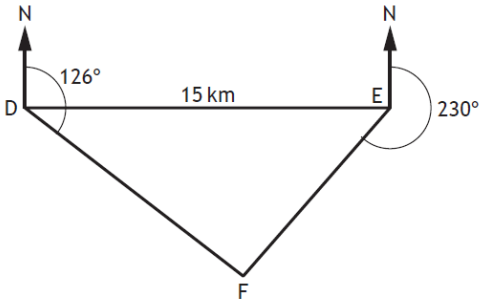
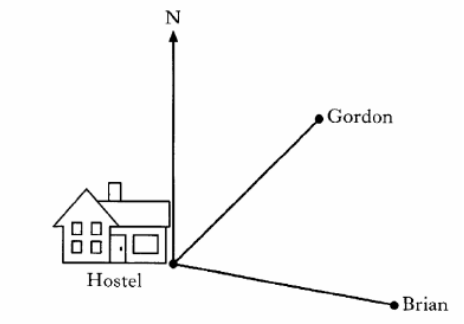


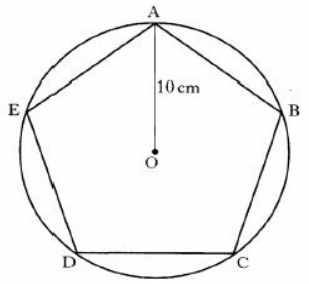
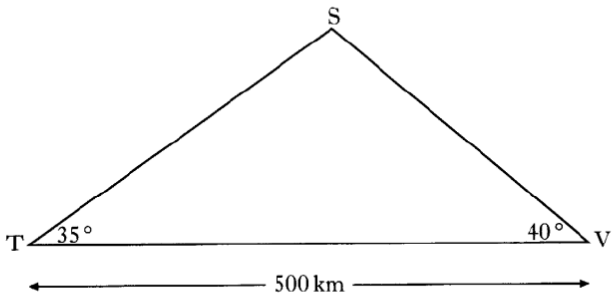
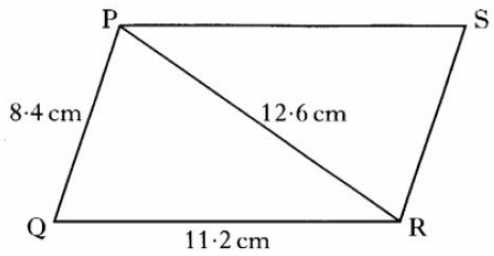
Calculate the length of PR. 3

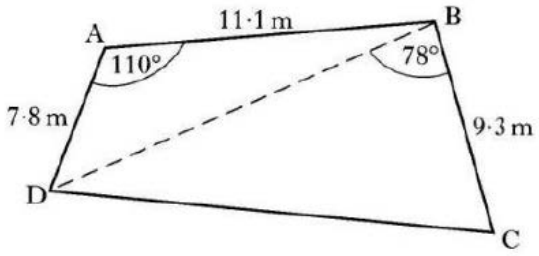
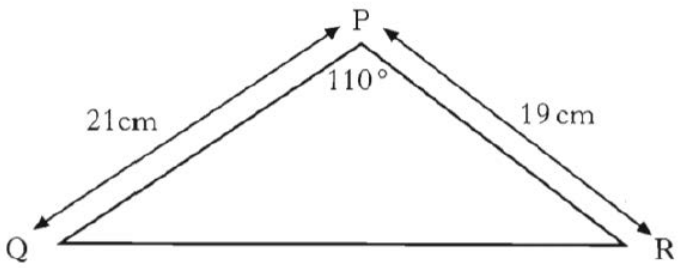
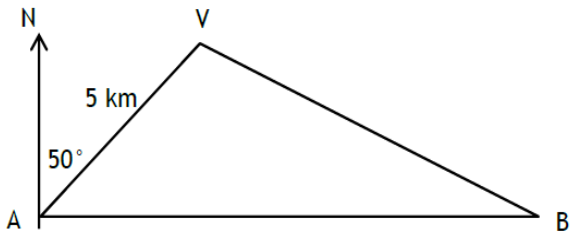
Ans	9.8cm	
2014 P1	**5.** In triangle KLM • KM = 18 centimetres • sin K = 0·4 • sin L = 0·9 Calculate the length of LM. 	3
Ans	8cm	
2014 P2	**10.** In a race, boats sail round three buoys represented by A, B, and C in the diagram below.  B is 8 kilometres from A on a bearing of 060°. C is 11 kilometres from B. A is 13 kilometres from C. (a) Calculate the size of angle ABC. (b) Hence find the size of the shaded angle.	3 2
Ans	(a) 84.8° (b) 155.2°	
2015 P2	**3.** Triangle ABC is shown below.  Calculate the length of AB.	3
Ans	0.78km	

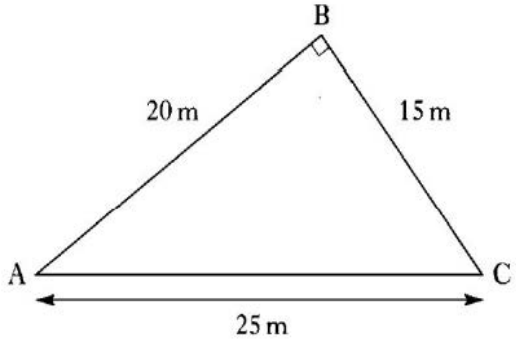
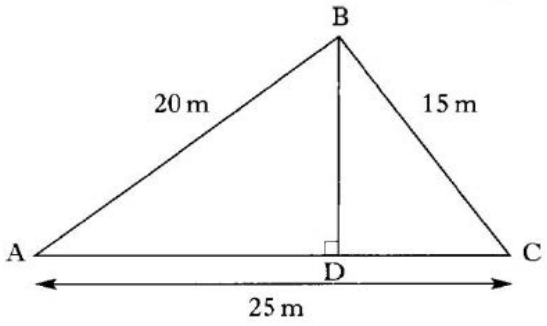
2015 P2	**13.** In the diagram below P, Q and R represent the positions of Portlee, Queenstown and Rushton respectively.  Portlee is 25 kilometres due South of Queenstown. From Portlee, the bearing of Rushton is 072°. From Queenstown, the bearing of Rushton is 128°. Calculate the distance between Portlee and Rushton. Do not use a scale drawing.	4
Ans	23.8km	
2016 P2	**8.** A set of stepladders has legs 150 centimetres and 140 centimetres long.  When the stepladder is fully open, the angle between the longer leg and the ground is 66°.  Calculate $x°$, the size of the angle between the shorter leg and the ground.	3
Ans	78°	

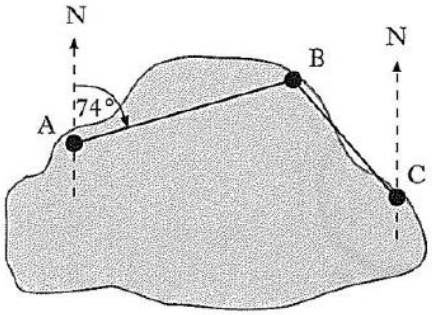
2016 P2	**16.** In the diagram below: • DE is perpendicular to AC. • AD = 4 centimetres. • DB = 6 centimetres. • AE = EC = 3 centimetres.  Calculate the length of BC. Give your answer correct to one decimal place.	4
Ans	6.8cm	
2017 P1	**7.** In triangle DEF: • DE = 8 centimetres • EF = 12 centimetres • $\sin E = \frac{2}{3}$  Calculate the area of triangle DEF.	2
Ans	32cm^2	
2017 P2	**3.** A piece of land is in the shape of a triangle as shown.  • PQ = 250 metres • PR = 180 metres • angle QPR = 147° The owner wishes to build a fence along the side QR. Calculate the length of the fence.	3

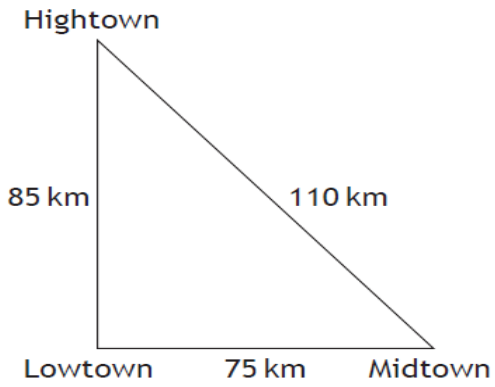
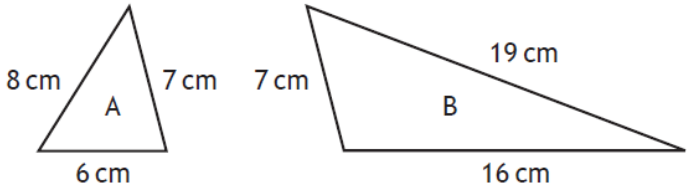
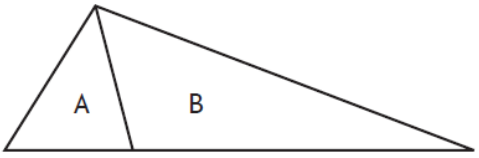
Ans	413m	
2017 P2	**10.** In the diagram below D, E and F represent the positions of Dunbridge, Earlsford and Fairtown respectively.  Dunbridge is 15 kilometres west of Earlsford. From Dunbridge, the bearing of Fairtown is 126°. From Earlsford the bearing of Fairtown is 230°. Calculate the distance between Dunbridge and Fairtown. **Do not use a scale drawing.**	4
Ans	9.9km	
PPA P2	**4.** Gordon and Brian leave a hostel at the same time. Gordon walks on a bearing of 045° at a speed of 4.4 kilometres per hour. Brian walks on a bearing of 100° at a speed of 4.8 kilometres per hour.  If they both walk at stead speeds, how far apart will they be after 2 hours?	5
Ans	8.5km	

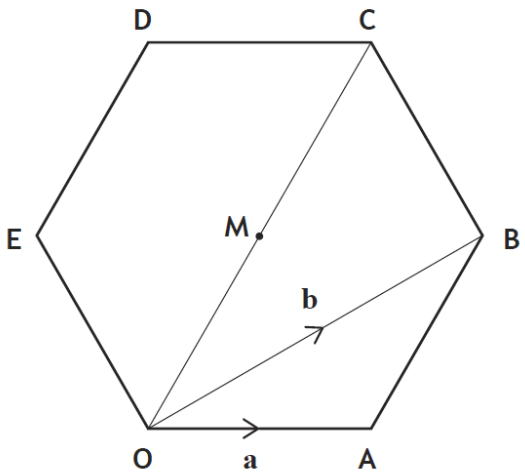
PP A P2	7.  A regular pentagon ABCDE is drawn in a circle, centre O, with radius 10 centimetres. Calculate the area of the regular pentagon.	5
Ans	237.76cm^2	
PP B P2	9. A TV signal is sent from a transmitter (T) via a satellite (S) to a village (V), as shown in the diagram. The village is 500 kilometres from the transmitter.  The signal is sent out at an angle of 35° and is received in the village at an angle of 40°. Calculate the height of the satellite above the ground.	5
Ans	190.8km	
PP C P2	10. The diagram shows a parallelogram, PQRS.  (a) Calculate the size of angle PQR. Do not use a scale drawing. (b) Calculate the area of the parallelogram.	3 3
Ans	a 78.6° b 92.22 cm^2	

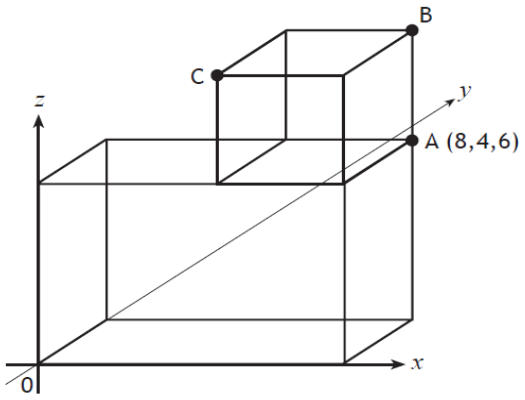
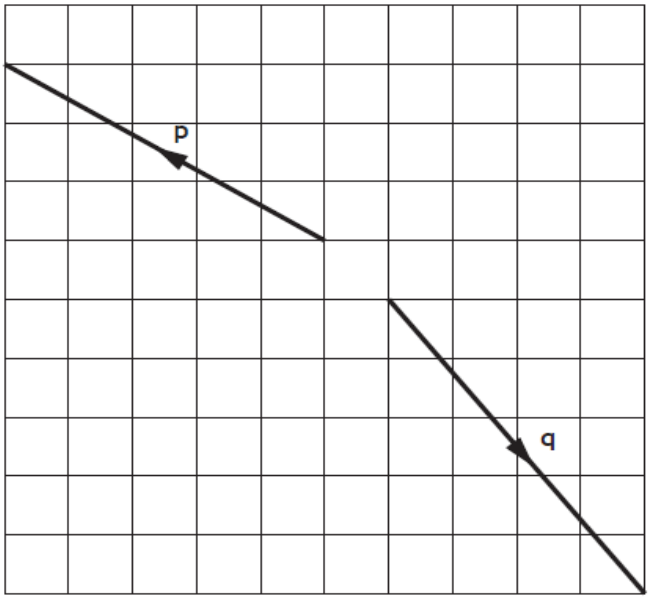
PP D P2	Q6. A garden, in the shape of a quadrilateral, is represented in the diagram.  Calculate: (a) the length of the diagonal BD; Do not use a scale drawing. (b) the area of the garden.	3
Ans	a 15.597… m b 111.6 m^2 (1dp)	
PP E P2	2.  Calculate the area of triangle PQR.	4
Ans	187.5 cm^2 (1 decimal place)	
PP E P2	8. David walks on a bearing of 050° from hostel A to viewpoint V, 5 kilometres away. Hostel B is due east of hostel A. Susie walks on a bearing of 294° from hostel B to the same viewpoint.  Calculate the length of AB, the distance between the two hostels.	5

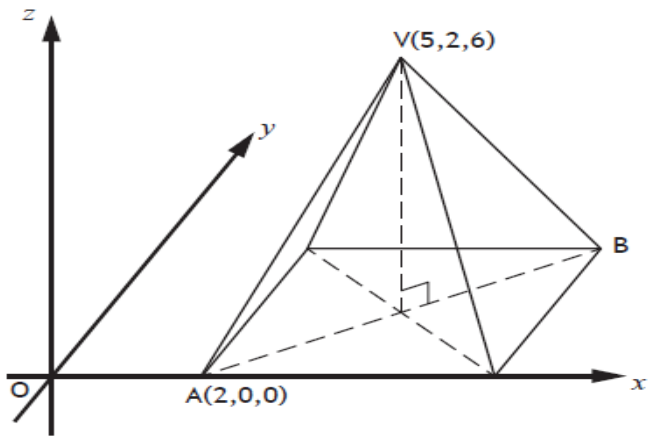
Ans	AB = 11.05 kilometres (2 decimal places)	
PP F P1	13. Triangle ABC is right-angled at B. The dimensions are shown.  (a) Calculate the area of triangle ABC. BD, the height of triangle ACB is drawn as shown.  (b) Use your answer to part (a) to calculate the height BD.	1 3
Ans	(a) 150 m^2 (sin 90° = 1) (b) 12 metres	

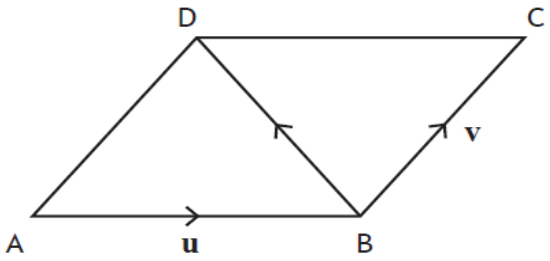
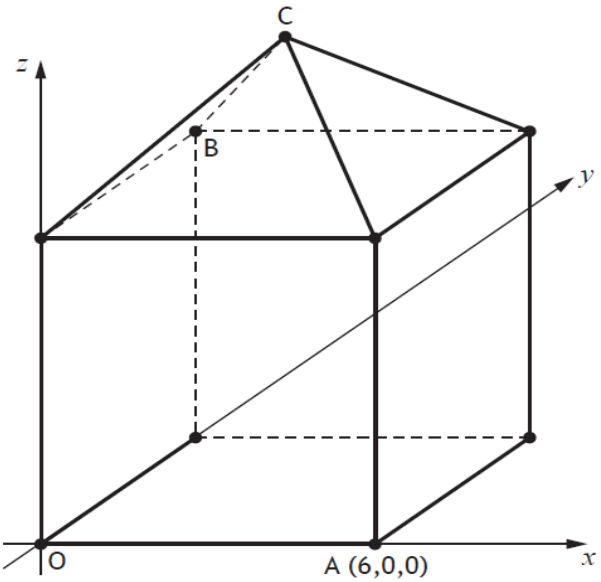
PP F P2	7. There are three mooring points on Lake Sorling. ○ From A, the bearing of B is 074°. ○ From C, the bearing of B is 310°.  (a) Calculate the size of angle ABC.	2
	B is 230 metres from A and 110 metres from C. (b) Calculate the direct distance from A to C. Give your answer to 3 significant figures.	4
Ans	(a) 124° (b) 305 metres (to 3 SF)	

2014 P2	**6.** The diagram below shows the position of three towns. Lowtown is due west of Midtown. The distance from • Lowtown to Midtown is 75 kilometres. • Midtown to Hightown is 110 kilometres. • Hightown to Lowtown is 85 kilometres.  Is Hightown directly north of Lowtown? **Justify your answer.**	4
Ans	**no, with valid reason.**	
2017 P2	**7.** Triangles A and B are shown below.  The triangles are placed together to form the larger triangle shown below.  Is this larger triangle right-angled? Justify your answer.	3
Ans	**no, with valid reason.**	

2018 SP P1	**11.** In the diagram, OABCDE is a regular hexagon with centre M. Vectors **a** and **b** are represented by $\overrightarrow{OA}$ and $\overrightarrow{OB}$ respectively.  (a) Express $\overrightarrow{AB}$ in terms of **a** and **b**. (b) Express $\overrightarrow{OC}$ in terms of **a** and **b**.	1 1
Ans	(a) $\boldsymbol{b}-\boldsymbol{a}$ (b) $2(\boldsymbol{b}-\boldsymbol{a})$	
2018 Sp P1	**3.** Two forces acting on a rocket are represented by vectors **u** and **v**. $\mathbf{u}=\begin{pmatrix}2\\-5\\-3\end{pmatrix}$ and $\mathbf{v}=\begin{pmatrix}7\\4\\-1\end{pmatrix}$. Calculate $\lvert\mathbf{u}+\mathbf{v}\rvert$, the magnitude of the resultant force. Express your answer as a surd in its simplest form.	3
Ans	$7\sqrt{2}$	
2014 P1	**4.** Find the resultant vector $2\boldsymbol{u}-\boldsymbol{v}$ when $\boldsymbol{u}=\begin{pmatrix}-2\\3\\5\end{pmatrix}$ and $\boldsymbol{v}=\begin{pmatrix}0\\-4\\7\end{pmatrix}$. Express your answer in component form.	2
Ans	$\begin{pmatrix}-4\\10\\3\end{pmatrix}$	

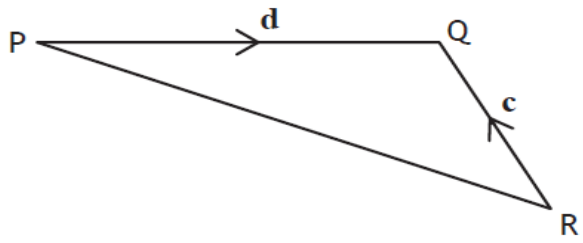
2014 P2	**2.** The diagram shows a cube placed on top of a cuboid, relative to the coordinate axes.  A is the point (8,4,6). Write down the coordinates of B and C.	2
Ans	**B (8, 4, 10), C (4, 0, 10)**	
2015 P2	**4.** Find $\lvert\mathbf{u}\rvert$, the magnitude of vector $\mathbf{u} = \begin{pmatrix} 6 \\ -13 \\ 18 \end{pmatrix}$.	2
Ans	**23**	
2015 P2	**5.** The vectors p and q are shown in the diagram below. Find the resultant vector p + q. Express your answer in component form.  	2

Ans	$\begin{pmatrix}-1\\-2\end{pmatrix}$	
2016 P1	**1.** Given $\mathbf{p} = \begin{pmatrix}4\\-6\end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix}-5\\-1\end{pmatrix}$. Find the resultant vector $\frac{1}{2}\mathbf{p}+\mathbf{q}$. Express your answer in component form.	2
Ans	$\begin{pmatrix}-3\\-4\end{pmatrix}$	
2016 P1	**7.** The diagram shows a rectangular based pyramid, relative to the coordinate axes.  • A is the point (2,0,0). • V is the point (5,2,6). (a) Write down the coordinates of B. (b) Calculate the length of edge AV of the pyramid.	1 3
Ans	(a) (8, 4, 0) (b) 7	

2016 P2	**3.** The diagram below shows parallelogram ABCD.  $\overrightarrow{AB}$ represents vector **u** and $\overrightarrow{BC}$ represents vector **v**. Express $\overrightarrow{BD}$ in terms of **u** and **v**.	1
Ans	v – u	
2017 P1	**5.** The diagram shows a square-based pyramid placed on top of a cube, relative to the coordinate axes.  The height of the pyramid is half of the height of the cube. A is the point (6,0,0). The point C is directly above the centre of the base. Write down the coordinates of B and C.	2
Ans	B (0, 6, 6), C (3, 3, 9)	
2017 P2	**1.** Find $\lvert\mathbf{v}\rvert$, the magnitude of vector $\mathbf{v} = \begin{pmatrix} 18 \\ -14 \\ 3 \end{pmatrix}$.	2
Ans	23	

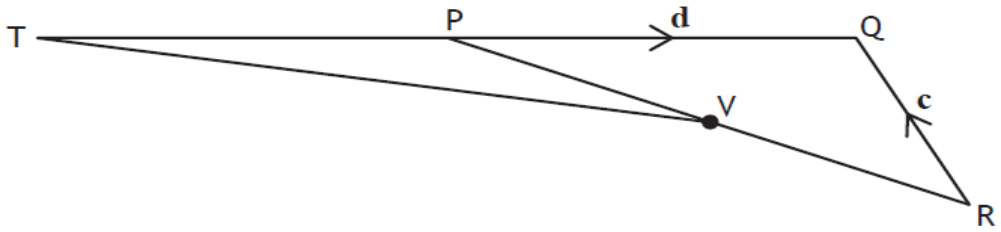
2017 P2

8. In the diagram below, $\overrightarrow{RQ}$ and $\overrightarrow{PQ}$ represent the vectors $\mathbf{c}$ and $\mathbf{d}$ respectively.



(a) Express $\overrightarrow{PR}$ in terms of $\mathbf{c}$ and $\mathbf{d}$. 1

The line QP is extended to T.



- TP = PQ
- V is the midpoint of PR

(b) Express $\overrightarrow{TV}$ in terms of $\mathbf{c}$ and $\mathbf{d}$.
Give your answer in simplest form. 2

Ans

(a) $\mathbf{d} - \mathbf{c}$
(b) $\frac{3}{2}\boldsymbol{d} - \frac{1}{2}\boldsymbol{c}$

PP A P1

6. Two vectors are defined as $\boldsymbol{u} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$ and $\boldsymbol{v} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$.

(a) Find the resultant vector $\boldsymbol{u} + 3\boldsymbol{v}$. 1

(b) Find $|\boldsymbol{u} + 3\boldsymbol{v}|$. 2

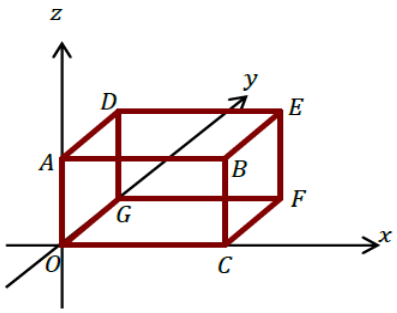
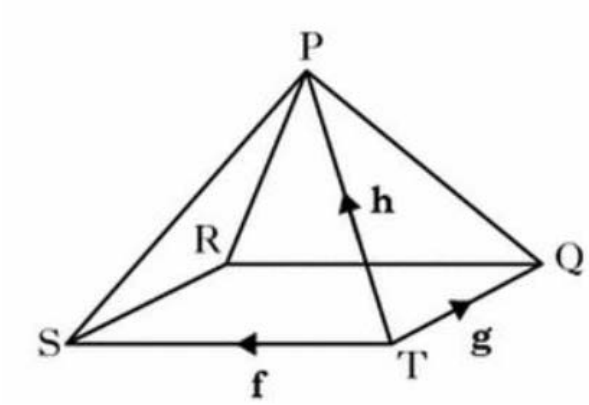
Ans

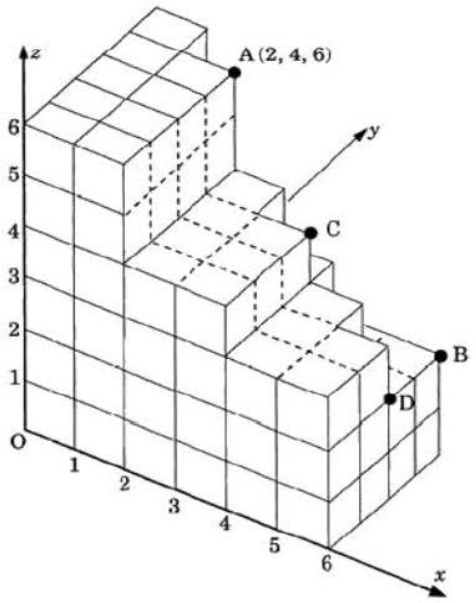
6a. $\begin{pmatrix} -10 \\ 4 \end{pmatrix}$ b. $2\sqrt{29}$

PP B P1

5. Vector $\boldsymbol{u}$ has components $\begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}$ and vector $\boldsymbol{v}$ has components $\begin{pmatrix} 2 \\ -4 \\ 1 \end{pmatrix}$. 2

Calculate $|4\boldsymbol{u} - 2\boldsymbol{v}|$.

Ans	10	
PP B P2	11. Look at the cuboid shown on the coordinate diagram. The coordinates of point E are $(5,3,1)$  (a) State the coordinates of F (b) State the coordinates of G (c) What is the shortest distance between points D and C?	4
Ans	11a. F (5, 3, 0) b. G (0, 3, 0) c. $\sqrt{35}$	
PP D P1	6. The diagram shows a square based pyramid PQRST.  Express $\overrightarrow{RP}$ in terms of $\boldsymbol{f}, \boldsymbol{g}$ and $\boldsymbol{h}$.	3
Ans	$\boldsymbol{h} - \boldsymbol{f} - \boldsymbol{g}$ or equivalent	

PP E P2	4. Relative to coordinate axes, the point A has coordinates (2, 4, 6). (a) Find the coordinates of C and D. (b) Write down the coordinates of B.  	2 1
Ans	(a) C(4,3,4), D(6,2,2) (b) B(6,4,2)	
PP F P1	5. Given that $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 0 \\ -3 \end{pmatrix}$ calculate $\left\lvert\overrightarrow{AB}\right\rvert$. Give your answer as a surd in its simplest form.	3
Ans	$3\sqrt{2}$	

2018 SP P2	**1.** Beth normally cycles a total distance of 64 miles per week. She increases her total distance by 15% each week for the next three weeks. How many miles does she cycle in the third week? Give your answer to the nearest mile.	3
Ans	97 miles	
2014 P1	**9.** 480 000 tickets were sold for a tennis tournament last year. This represents 80% of all the available tickets. Calculate the total number of tickets that were available for this tournament.	3
Ans	600 000	
2014 P2	**1.** There are 964 pupils on the roll of Aberleven High School. It is forecast that the roll will decrease by 15% per year. What will be the expected roll after 3 years? Give your answer to the nearest ten.	3
Ans	590	
2015 P2	**1.** A house is valued at £240 000. Its value is predicted to rise by 2·8% per annum. Calculate its predicted value after 2 years.	3
Ans	**£253 628 (·16)**	
2015 P2	**8.** James paid £297·50 for a laptop in a sale. The discount in the sale was 15%. Calculate the original price of the laptop.	3
Ans	£350	
2016 P2	**1.** A drinks manufacturer is reducing the sugar content of one of their fizzy drinks by 8% per year over the next 3 years. The sugar content of a standard can is currently 35 grams. Calculate the sugar content of a standard can after 3 years.	3
Ans	**27·(25408) grams**	

2017 P2	2. A necklace is valued at £1200. Its value is expected to increase by 4·5% per year over the next 3 years. Calculate the expected value of the necklace after this time. Give your answer to the nearest pound.	3
Ans	£1369	
2017 P2	5. A theatre group sold 4830 tickets for their show. This was 15% more than they sold last year. How many tickets did they sell last year?	3
Ans	4200	
PP A P2	1. The population of a city is increasing at a steady rate of 2.4% per annum. The current population is 528 000. What is the expected population in 4 years? Give your answer to the nearest thousand.	3
Ans	581 000	
PP B P2	2. A microwave oven is sold for £150. This price includes VAT at 20%. Calculate the price of the microwave oven without VAT.	3
Ans	£125	
PP B P2	8. The population of Newtown is 50 000. The population of Newtown is increasing at a steady rate of 5% per annum. The population of Auldtown is 108 000. The population of Auldtown is decreasing at a steady rate of 20% per annum. How many years will it take until the population of Newtown is greater than the population of Auldtown?	5
Ans	3 years	
PP C P2	1. Bacteria in a test-tube increase at the rate of 4.6% per hour. At 12 noon, there are 50 000 bacteria. At 5 pm, how many bacteria will be present? Give your answer correct to 3 significant figures.	4

Ans	62 600	
PP D P1	5. Marmalade is on special offer. Each jar on special offer contains 12.5% more than the standard jar.  A jar on special offer contains 450 g of marmalade. How much does the standard jar contain?	3
Ans	400g	
PP D P2	Q1. The average Scottish house price is £153 100. The average price is expected to rise by 2.5% per month. What will the average Scottish house price be in 3 months? Give your answer correct to three significant figures.	3
Ans	£165 000	
PP E P2	3. In the evening, the temperature in a greenhouse drops by 10.4% per hour. At 8 p.m. the temperature was 28° Celsius. Find the temperature at 11 p.m.	3
Ans	20°C (nearest degree)	

PP F P1	11. Cleano washing powder is on special offer.  Each box on special offer contains 20% more powder than the standard box. A box on special offer contains 900 grams of powder. How many grams of powder does the standard box contain?	3
Ans	750g	
PP F P2	2. A boat was bought for £35 000. Its value decreases by 8% each year. How much will the boat be worth after 4 years?	3
Ans	£25 073.75	

2018 SP P1	1. Evaluate $2\frac{3}{8} \div \frac{5}{16}$.	2
Ans	$7\frac{3}{5}$	
2014 P1	1. Evaluate $\frac{5}{12} \times 2\frac{2}{9}$. Give the answer in simplest form.	2
Ans	$\frac{25}{27}$	
2015 P1	1. Evaluate $6\frac{1}{5} - 2\frac{1}{3}$.	2
Ans	$3\frac{13}{15}$ or $\frac{58}{15}$	
2016 P1	2. Evaluate $\frac{3}{4}\left(\frac{1}{3} + \frac{2}{7}\right)$. Give your answer in its simplest form.	2
Ans	$\frac{13}{28}$	
2017 P1	3. Evaluate $1\frac{5}{6} \div \frac{3}{4}$. Give your answer in its simplest form.	2
Ans	$\frac{22}{9}$ or $2\frac{4}{9}$	
PP A P1	1. Evaluate $3\frac{2}{5} - 1\frac{3}{4}$	2
Ans	$1\frac{13}{20}$	

PP B P2	2. Evaluate $1\frac{1}{8} \div \frac{3}{4}$	2
Ans	$1\frac{1}{2}$	
PP C P1	2. Evaluate $\frac{2}{7}\left(1\frac{3}{4}+\frac{3}{8}\right)$.	2
Ans	$\frac{17}{28}$	
PP D P1	2. Evaluate $\frac{2}{5}$ of $3\frac{1}{2}+\frac{4}{5}$	3
Ans	$\frac{11}{5}$ or $2\frac{1}{5}$	
PP E P1	1. Evaluate $2\frac{1}{3}+\frac{5}{6}$ of $1\frac{2}{5}$	3
Ans	$3\frac{1}{2}$	
PP F P1	1. Evaluate $1\frac{3}{5}+2\frac{4}{7}$.	2
Ans	$4\frac{6}{35}$	

PP B P1	1. Evaluate $7.18 - 2.1 \times 3$.	2
Ans	0·88	
PP C	1. Evaluate 5.04 + 8.4 ÷ 7.	2
Ans	6·24	

2014 P2	**4.** A runner has recorded her times, in seconds, for six different laps of a running track. 53 57 58 60 55 56 (a) (i) Calculate the mean of these lap times. **Show clearly all your working.** (ii) Calculate the standard deviation of these lap times. **Show clearly all your working.** (b) She changes her training routine hoping to improve her consistency. After this change, she records her times for another six laps. The mean is 55 seconds and the standard deviation 3·2 seconds. Has the new training routine improved her consistency? **Give a reason for your answer.**	1 3 1
Ans	(a) (i) $\bar{x} = 56.5$ (ii) s = 2.4 (b) No, standard deviation is greater. No, times are more spread out.	
2015 P1	**5.** The standard deviation of 1, 2, 2, 2, 8 is equal to $\sqrt{a}$. Find the value of a.	3
Ans	a = 8	
2015 P1	**10.** Ten couples took part in a dance competition. The couples were given a score in each round. The scores in the first round were 16 27 12 18 26 21 27 22 18 17 (a) Calculate the median and semi-interquartile range of these scores. (b) In the second round, the median was 26 and the semi-interquartile range was 2·5. Make two valid comparisons between the scores in the first and second rounds.	3 2
Ans	(a) Median = 19.5, SIQR = 4.5 (b) Valid comments – On average the second round's scores are higher. The second round's scores are more consistent.	

2016 P2	**6.** Jack called his internet provider on six occasions to report connection problems. On each occasion he noted the length of time he had to wait before speaking to an adviser. The times (in minutes) were as follows: 13 16 10 22 5 12 (a) Calculate the mean and standard deviation of these times. (b) Sophie also called the same internet provider, on several occasions, to report connection problems. Her mean waiting time was 15 minutes and the standard deviation was 4·3 minutes. Make two valid comments comparing Sophie's waiting times with Jack's waiting times.	4 2
Ans	(a) Mean = 13 minutes, Standard Deviation = 5.7 minutes (b) Valid comments – On average, Sophie waited longer. Sophie's waiting times were less spread out.	
2017 P1	**2.** The number of calls received by the police was recorded over 10 days. The results are shown below. 198 216 218 230 232 247 248 250 265 267 Find the semi-interquartile range of this data.	2
Ans	16	
2017 P1	**12.** Gym members are asked to fill out a questionnaire to rate the quality of service provided. They are asked to give a rating on a scale of 1 to 6. The ratings given by five members were as follows: 1 4 6 3 6 In its simplest form, the standard deviation of these ratings can be written as $\frac{a\sqrt{b}}{2}$. Find the values of a and b.	4
Ans	a = 3, b = 2	

PP A P2	2. Two groups of 6 students are given the same test. (a) The marks of Group A are: 73 47 59 71 48 62. Use an appropriate formula to calculate the mean and the standard deviation. Show clearly all your working. (b) In Group B, the mean is 60 and the standard deviation is 29.8. Compare the results of the two groups.	4 2
Ans	2a. $\bar{x} = 60$, $s = 11.03$ (2dp) 2b. On average the marks of both groups are the same since $60 = 60$ However, the marks from Group A are much more consistent since $11.03 < 29.8$.	
PP B P1	10. A sample of students was asked how many times each had visited the cinema in the last three months. The results are shown below. 4 5 4 1 4 3 2 2 4 6 2 3 4 4 1 3 1 2 3 1 1 (a) From the above data, find the median, the lower quartile and the upper quartile. (b) Calculate the semi-interquartile range. (c) The same sample of students was asked how many times each had attended a football match in the same three months. The data had a median of 5 and a semi-interquartile range of 3. Make two appropriate comments comparing students visiting the cinema and students attending a football match.	3 1 2
Ans	10a. median $= 3$, $Q_1 = 1{\cdot}5$, $Q_3 = 4$ b. $1{\cdot}25$ 10c. On average the students went to more football matches than to the cinema since $5 > 3$. The number of times the students visited the cinema was more consistent since $1{\cdot}25 < 3$.	

PP B P2	3. (a) The price, in pence, of a carton of milk in six different supermarkets is shown below. 66 70 89 75 79 59 Use an appropriate formula to calculate the mean and standard deviation of these prices. Show clearly all your working. (b) In six local shops, the mean price of a carton of milk is 73 pence with a standard deviation of 17.7 pence. Compare the supermarket prices with those of the local shops.	4 2
Ans	3a. $\bar{x} = 73$, s = 10.5 3b. On average, milk is the same price in both types of shop since 73 = 73. The price of milk is more consistent in supermarkets since $10{\cdot}5 < 17{\cdot}7$.	
PP C P1	6. A hotel books taxis from a company called Quick-Cars. The receptionist notes the waiting time for every taxi ordered over a period of two weeks. These times, in minutes, are shown below. 12 25 29 37 6 13 26 32 42 7 14 29 35 44 (a) For the given data, calculate: (i) the median (ii) the lower quartile (iii) the upper quartile (b) Calculate the semi-interquartile range. In another two week period, the hotel books taxis from a company called Fast-Cabs. The median waiting time for Fast-Cabs is found to be 27.5 minutes and the semi-interquartile range for Fast-Cabs is found to be 2.5 minutes. (c) Use this information to compare the two companies.	1 1 1 1 2
Ans	a (i) 27.5 (ii) $Q_1 = 13$ (iii) $Q_3 = 35$ b 11 c On average, both companies have the same waiting time since 27.5 = 27.5 Waiting times for Fast-Cabs are more consistent since 2.5 < 11	

PP D P1

4. The marks scored by a group of students in their October test are listed below.

41 56 68 59 43 37 70 58 61 47 75 66

(a) Calculate:

(i) The median mark; 2

(ii) The semi-interquartile range for the data.

The teacher arranges extra revision classes for the students before their next test in December.

In this test the median mark is 67 and the semi-interquartile range is 7.

(b) Make two appropriate comments comparing the marks in the October and December tests. 2

Ans

a(i) Median $= 58 \cdot 5$ (ii) SIQR = 11

b On average, after the extra revision classes, there was an improvement in the students' marks since $67 > 58 \cdot 5$.
After the extra classes the marks were more consistent since $7 < 11$.

PP D P2

Q2. The heights, in millimetres, of six seedlings are given below.

15 18 14 17 16 19

(a) Calculate:

(i) the mean; 1

(ii) the standard deviation; 3

of these heights.

Show clearly all your working.

(b) Later the same six seedlings are measured again.
Each has grown by 4 millimetres.

State:

(i) the mean; 1

(ii) the standard deviation; 1

of these new heights.

Ans

a (i) 16.5 mm (ii) 1.87 mm (2dp)

b (i) 20.5 mm (ii) 1.87 mm (2dp)

PP F P1

3. A group of people attended a course to help them stop smoking.

The following table shows the statistics before and after the course.

	Mean number of cigarettes smoked per person per day	Standard deviation
Before	20.8	8.5
After	9.6	12.0

Make **two** valid comments about these results.

2

Ans

On average the number of cigarettes smoked per person went down after the course since $9{\cdot}6 < 20{\cdot}8$.

However, the number of cigarettes smoked per person before the course was more consistent since $8{\cdot}5 < 12{\cdot}0$.