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## Chapter 1

# GCSE Revision - Algebraic Proof and Algebra in Context

1. Use algebra to prove that the sum of three consecutive whole numbers is always divisible by 3.
2. Prove that  $(2n + 3)^2 - (2n - 3)^2$  is a multiple of 8 for all positive integer values of  $n$ .
3. The diagram shows a trapezium.

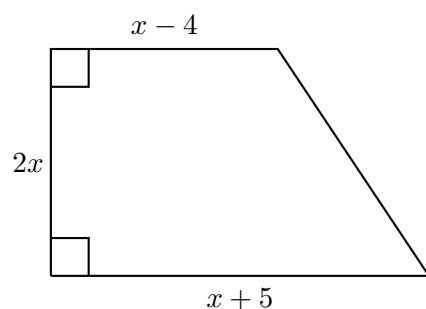


Diagram **NOT**  
accurately drawn

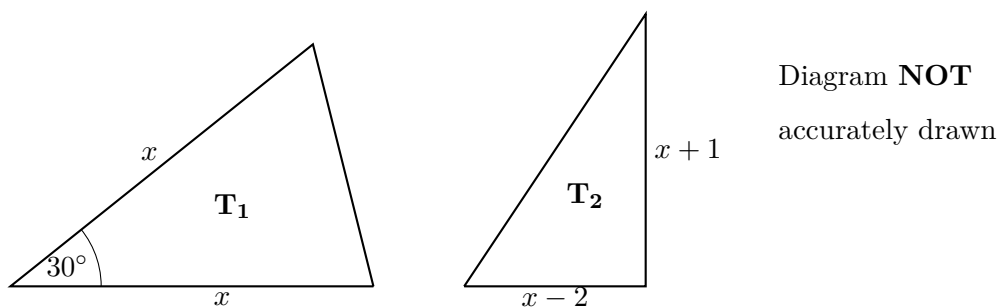
All the measurements are in centimetres.

The area of the trapezium is  $351\text{cm}^2$ .

(a) Show that  $2x^2 + x - 351 = 0$ . (2)

(b) Work out the value of  $x$ . (3)

4. Here are two triangles **T**<sub>1</sub> and **T**<sub>2</sub>.



The lengths of the sides are in centimetres.

The area of triangle **T**<sub>1</sub> is equal to the area of triangle **T**<sub>2</sub>.

Work out the value of  $x$ , giving your answer in the form  $a + \sqrt{b}$  where  $a$  and  $b$  are integers.

5. Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

6.

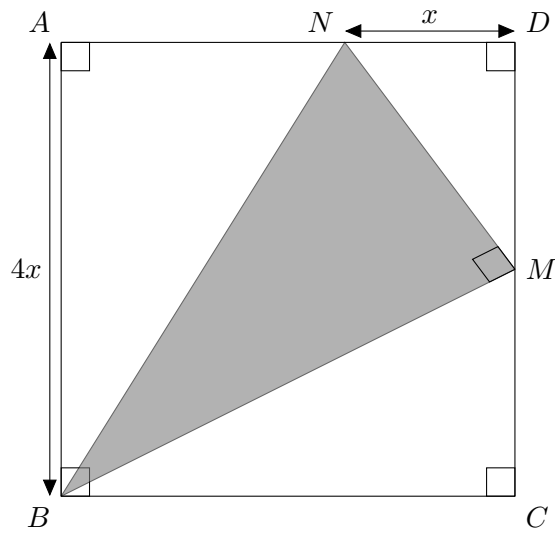


Diagram **NOT**  
accurately drawn

$ABCD$  is a square with a side length of  $4x$ .

$M$  is the midpoint of  $DC$ .

$N$  is the point on  $AD$  where  $ND = x$ .

$BMN$  is a right-angled triangle.

Find an expression, in terms of  $x$ , for the area of triangle  $BMN$ .

Give your expression in its simplest form.

7.

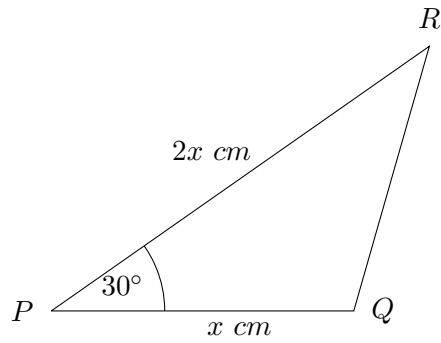


Diagram **NOT**  
accurately drawn

$$PQ = x \text{ cm}$$

$$PR = 2x \text{ cm}$$

$$\text{Angle } QPR = 30^\circ$$

The area of triangle  $PQR = A \text{ cm}^2$

Show that  $x = \sqrt{2A}$ .

8.

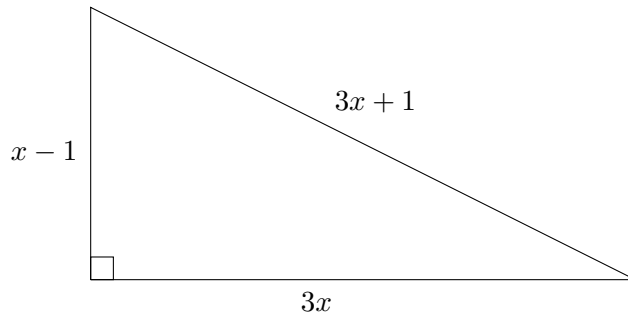


Diagram **NOT**  
accurately drawn

In the diagram, all the measurements are in metres.

The perimeter of the triangle is 56 m.

The area of the triangle is  $A \text{ m}^2$ .

Work out the value of  $A$ .



9.

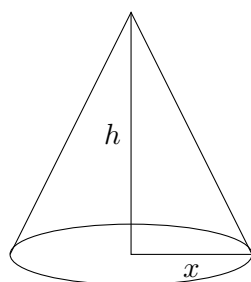
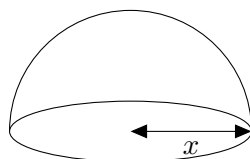


Diagram **NOT**  
accurately drawn



The diagram shows a solid cone and a solid hemisphere.

The cone has a base of radius  $x$  cm and a height of  $h$  cm.

The hemisphere has a base of radius  $x$  cm.

The surface area of the cone is equal to the surface area of the hemisphere.

Find an expression for  $h$  in terms of  $x$ .

10. Umar thinks  $(a + 1)^2 = a^2 + 1$  for all values of  $a$ .

(a) Show that Umar is wrong. (2)

(b) Here are two right-angled triangles.

All the measurements are in centimetres

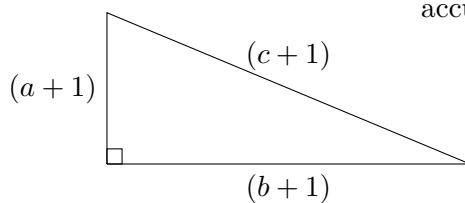
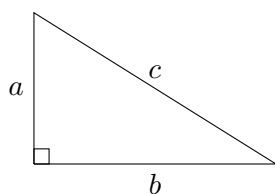


Diagram **NOT**  
accurately drawn

Show that  $2a + 2b + 1 = 2c$ .  $a$ ,  $b$  and  $c$  cannot all be integers. (3)

(c) Explain why. (1)

11. The diagram below shows a large rectangle of length  $(2x + 6)$  cm and width  $x$  cm. A smaller rectangle of length  $x$  cm and width 3 cm is cut out and removed.

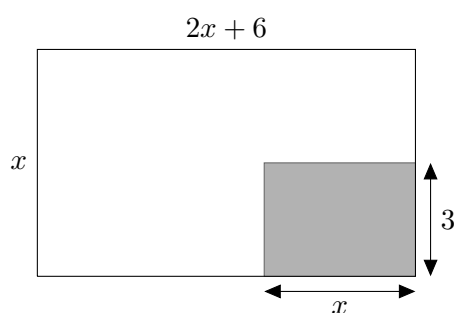


Diagram **NOT**  
accurately drawn

The area of the shape that is left is  $100 \text{ cm}^2$

(a) Show that  $2x^2 + 3x - 100 = 0$ . (3)

(b) Calculate the length of the smaller rectangle. Give your answer correct to 3 significant figures. (4)

12.

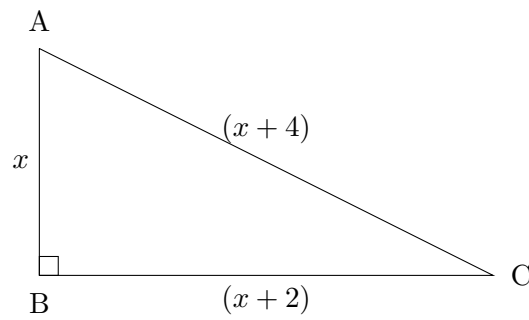


Diagram **NOT**  
accurately drawn

ABC is a right-angled triangle.

All the measurements are in centimetres.

$$AB = x$$

$$BC = (x + 2)$$

$$AC = (x + 4)$$

(a) Show that  $x^2 - 4x - 12 = 0$ . (3)

(b) (4)

i. Solve  $x^2 - 4x - 12 = 0$

ii. Hence, write down the length of  $AC$ .

13. Prove that the difference between the squares of two consecutive odd numbers is a multiple of 8.

14. Prove that  $n^2 + n + 1$  is always odd for all integers  $n$ .

15. Factorise  $2t^2 + 5t + 2$ . Hence explain why  $2t^2 + 5t + 2$  can never be a prime number for any positive whole number value of  $t$ .

## Chapter 2

# GCSE Revision - Algebra - (Excluding Geometric problems and proofs)

1. (a) Simplify  $x^7 \times x^3$

(b) Simplify  $(m^4)^3$

(c) Simplify  $\frac{36af^8}{12a^5f^2}$

**Total for Question 1 is 7 marks**

2. (a) Solve  $\frac{4(8x-2)}{3x} = 10$  (3)

(b) Write as a single fraction in its simplest form (3)

$$\frac{2}{y+3} - \frac{1}{y-6}$$

3. Solve the simultaneous equations

$$3x + 4y = 5$$

$$2x - 3y = 9$$

$$x = \text{-----}$$

$$y = \text{-----}$$

**Total for Question 3 is 4 marks**

4.

$$A = 4bc$$

$$A = 100$$

$$b = 2$$

(a) Work out the value of  $c$ . (2)

(b) Make  $k$  the subject of the formula,  $m = \sqrt{\frac{k+1}{4}}$ . (3)

5. Solve  $\frac{4x-1}{5} + \frac{x+4}{2} = 3$  (3)

$x = \text{-----}$

6. (a) Simplify  $a^4 \times a^5$  (1)

(b) Simplify  $\frac{45e^6f^8}{5ef^2}$  (2)

(c) Write down the value of  $9^{\frac{1}{2}}$ . (1)

7. Solve the simultaneous equations (6)

$$x^2 + y^2 = 9$$

$$x + y = 2$$

Give your answers correct to 2 decimal places.

$$x = \text{-----} \quad y = \text{-----}$$

$$\text{or } x = \text{-----} \quad y = \text{-----}$$

8. Make  $p$  the subject of the formula  $y = 3p^2 - 4$ . (3)

9. (a) Factorise  $6 + 9x$ . (1)

- (b) Factorise  $y^2 - 16$ . (1)

- (c) Factorise  $2p^2 - p - 10$ . (2)



10. Solve  $\frac{2-y}{5} = 1$ . (5)

$y = \dots\dots\dots$

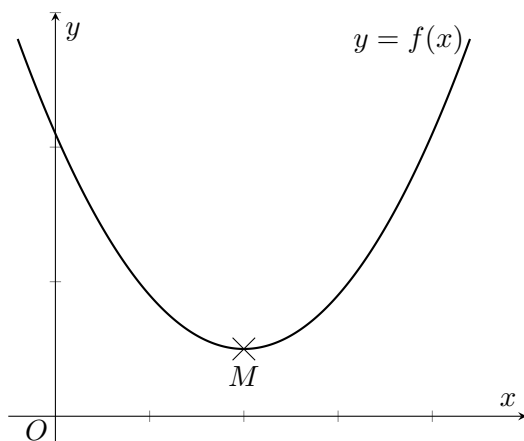
11. The expression  $x^2 - 8x + 21$  can be written in the form  $(x - a)^2 + b$  for all values of  $x$ .

(a) Find the value of  $a$  and the value of  $b$ . (3)

$a = \dots\dots\dots$

$b = \dots\dots\dots$

The equation of a curve is  $y = f(x)$  where  $f(x) = x^2 - 8x + 21$ . The diagram shows part of a sketch of the graph of  $y = f(x)$ .



The minimum point of the curve is  $M$ .

(b) Write down the coordinates of  $M$ . (1)

(  $\dots\dots\dots$ ,  $\dots\dots\dots$  )

12. Simplify  $\frac{4(x+5)}{x^2+2x-15}$ . (2)

13. Solve the simultaneous equations (4)

$$4x + 7y = 1$$

$$3x + 10y = 15$$

$$x = \text{-----}$$

$$y = \text{-----}$$

(a) Solve  $2x^2 + 9x - 7 = 0$ . Give your solutions correct to 3 significant figures. (3)

(b) Solve  $\frac{2}{y^2} + \frac{9}{y} - 7 = 0$ . Give your solutions correct to 3 significant figures. (2)

14. Simplify  $\frac{x+1}{2} + \frac{x+3}{3}$ . (3)

15. (a) i. Factorise  $2t^2 + 5t + 2$ .

ii.  $t$  is a positive whole number.

The expression  $2t^2 + 5t + 2$  can never have a value that is a prime number.

Explain why. (3)

16. Make  $t$  the subject of the formula (4)

$$p = \frac{3 - 2t}{4 + t}$$

17. Solve  $\frac{5(2x + 1)^2}{4x + 5} = 5x - 1$ . (5)

18. Solve the equations (4)

$$3x + 5y = 19$$

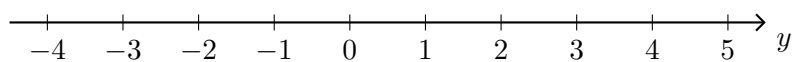
$$4x - 2y = -18$$

$$x = \text{-----}$$

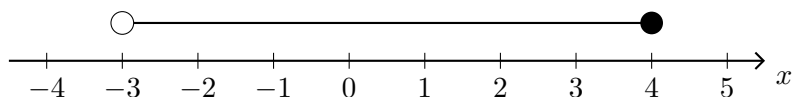
$$y = \text{-----}$$

19. Solve the equation  $5x^2 + 8x - 6 = 0$ . Give each solution correct to 2 decimal places. (3)

20. (a) On the number line below, show the inequality  $-2 < y < 3$ . (1)



- (b) Here is an inequality, in  $x$ , shown on a number line. (2)



Write down the inequality.

- (c) Solve the inequality  $4t - 5 > 9$ . (2)

21. (a) Factorise fully  $2x^2 - 4xy$ . (2)

- (b) Factorise  $p^2 - 6p + 8$ . (2)

- (c) Simplify  $\frac{(x+2)^2}{x+2}$ . (1)

- (d) Simplify  $2a^2b \times 3a^3b$ . (2)

22. Solve  $3x^2 - 4x - 2 = 0$  Give your solutions correct to 3 significant figures. (3)

23. Make  $t$  the subject of the formula  $2(d - t) = 4t + 7$ . (3)

$t = \text{-----}$

24. (a) Simplify fully  $\frac{x^2 + 3x - 4}{2x^2 - 5x + 3}$ . (3)

(b) Write  $\frac{4}{x+2} + \frac{3}{x-2}$  as a single fraction in its simplest form. (3)

25. (a) Factorise  $x^2 + px + qx + pq$ . (2)

(b) Factorise  $m^2 - 4$ . (1)

(c) Write as a single fraction in its simplest form  $\frac{2}{x-4} - \frac{1}{x+3}$ . (3)

26. Find the exact solutions of  $x + \frac{3}{x} = 7$ . (3)

27.  $-2 \leq n < 5$ ,  $n$  is an integer.

(a) Write down all the possible values of  $n$ . (2)

(b) Solve the inequality  $4x + 1 > 11$ . (2)

28. Simplify  $(2n^3)^4$ . (2)

29. (a) Factorise  $2x^2 - 9x + 4$ . (2)

Hence, or otherwise,

(b) Solve  $2x^2 - 9x + 4 = (2x - 1)^2$  (4)

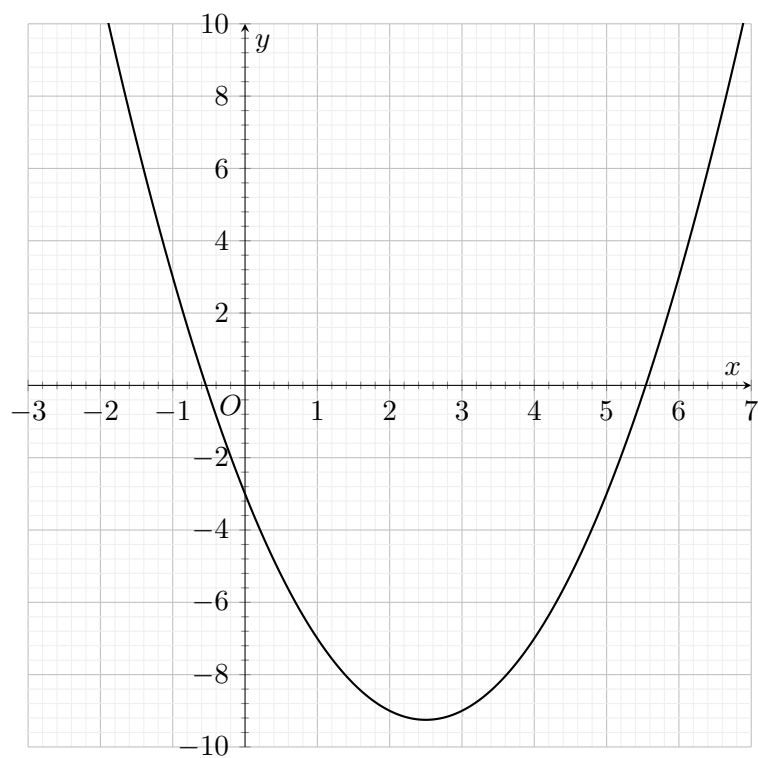
30.  $y = p - 2qx^2$

$p = -10, \quad q = 3, \quad x = -5$

(a) Work out the value of  $y$ . (2)

(b) Rearrange  $y = p - 2qx^2$  to make  $x$  the subject of the formula. (3)

31. The diagram shows the graph of  $y = x^2 - 5x - 3$



(a) Use the graph to find estimates for the solutions of. (3)

i.  $x^2 - 5x - 3 = 0$ .

ii.  $x^2 - 5x - 3 = 6$ .

(b) Use the graph to find estimates for the solutions of the simultaneous equations (3)

$$y = x^2 - 5x - 3$$

$$y = x - 4$$

32. The table shows six expressions.  $n$  is a positive integer.

$2n - 3$	$3n - 2$	$3(n + 4)$	$4n + 1$	$4(3n + 1)$	$2n + 1$
----------	----------	------------	----------	-------------	----------

(a) From the table, write the expression whose value is (2)

i. always even.

ii. always a multiple of 3.

(b) From the table, write the expression which is a factor of  $4n^2 - 1$ . (1)

33. Solve the equation  $\frac{x}{2} - \frac{2}{x+1} = 1$ . (4)



34. Make  $k$  the subject of the formula  $t = \frac{k}{k-2}$ . (4)

35. (a) Simplify completely  $\frac{12xy^3}{3x^2y^3}$ . (2)

36. (a) Expand and simplify  $(2x + 4y)(4x - 5y)$ . (2)

(b) Simplify fully  $\frac{(x+10)^5}{(x+10)^4}$ . (1)

(c) Simplify fully  $\frac{x^2 - 25}{x^2 + 7x + 10}$  (3)

(d) For all values of  $x$ ,  $x^2 + 6x - 2 = (x + p)^2 + q$ . Find the value of  $p$  and the value of  $q$ . (3)

$p = \text{-----}, q = \text{-----}$

37. Make  $v$  the subject of the formula  $t = \frac{v}{5} + 2$ . (2)

$v = \text{-----}$

## Chapter 3

# GCSE Revision - Angles (and Bearings)

1.

(4)

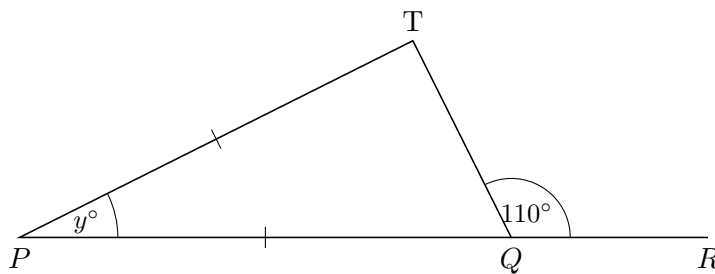


Diagram **NOT**  
accurately drawn

$PQR$  is a straight line.  $PT = PQ$ .

(a) Work out the value of  $y$ .

.....

(b) Give reasons for your answer.

-----  
-----

2.

(4)

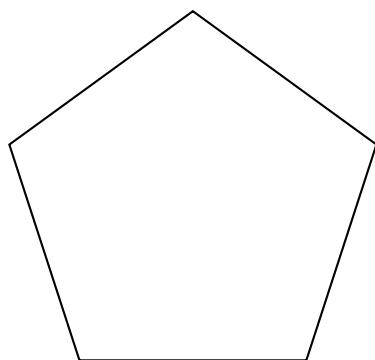


Diagram **NOT**  
accurately drawn

Work out the size of an exterior angle of a regular pentagon.

-----

3.

(3)

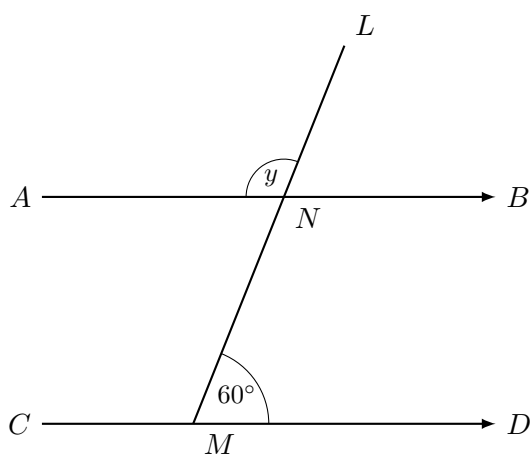


Diagram **NOT**  
accurately drawn

$ANB$  is parallel to  $CMD$ .  $LMN$  is a straight line. Angle  $LMD = 68^\circ$ .

(a) Work out the size of the angle marked  $y$ .

-----°

(b) Give reasons for your answer.

-----  
-----

4.

(2)

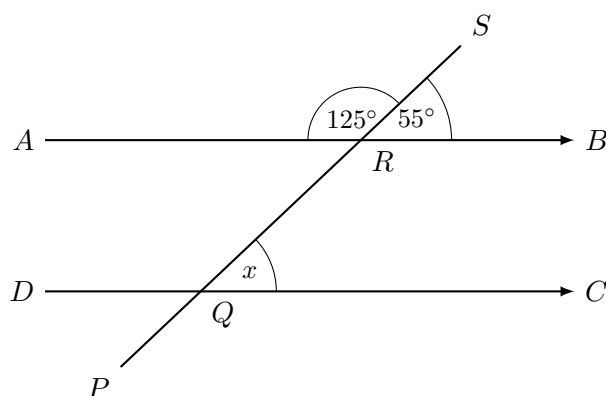


Diagram **NOT**  
accurately drawn

$ARB$  is parallel to  $DQC$ .  $PQRS$  is a straight line. Angle  $SRB = 55^\circ$ .

(a) Find the size of the angle marked  $x$ .

-----°

(b) Give a reason for your answer.

-----

5.

(3)

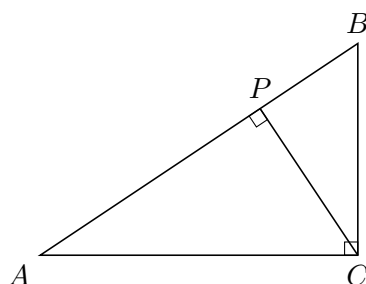


Diagram **NOT**  
accurately drawn

In the diagram,  $ABC$  is a triangle, angle  $ACB = 90^\circ$ ,  $P$  lies on the line  $AB$ ,  $CP$  is perpendicular to  $AB$ .

Prove that the angles of triangle  $APC$  are the same as the angles of triangle  $CPB$ .

6.

(4)

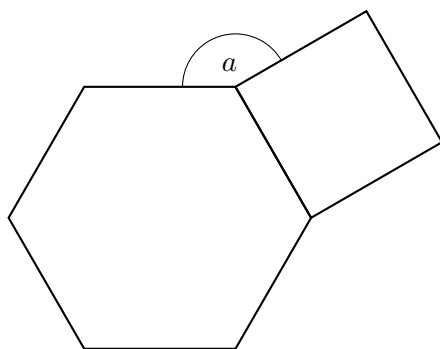


Diagram **NOT**  
accurately drawn

The diagram shows a regular hexagon and a square. Calculate the size of the angle  $a$ .

-----°

7.

(3)

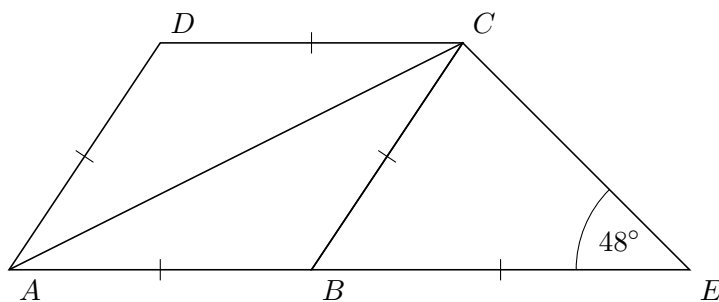


Diagram **NOT**  
accurately drawn

$ABCD$  is a rhombus.  $BCE$  is an isosceles triangle.  $ABE$  is a straight line.

Work out the size of angle  $DCA$ .

-----°

8.

(7)

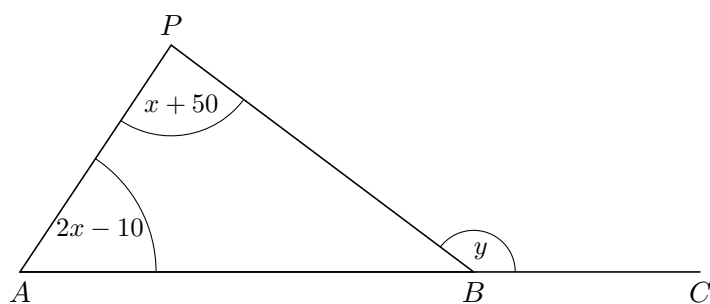


Diagram **NOT**  
accurately drawn

All angles are measured in degrees.  $ABC$  is a straight line.

Angle  $APB = x + 50$ , Angle  $PAB = x - 10$ , Angle  $PBC = y$ .

(a) Show that  $y = 3x + 40$ . Give reasons for each stage of your working. (3)

(b) Given that  $y = 145$  (4)

i. work out the value of  $x$ .

$x = \text{-----}$

ii. work out the size of the largest angle in triangle  $ABP$ .

$\text{-----}^\circ$

9.

(3)

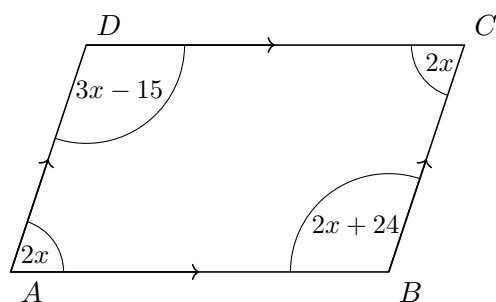


Diagram **NOT**  
accurately drawn

The diagram shows a parallelogram.

The sizes of the angles, in degrees, are as pictured. Work out the value of  $x$ .

$x =$  .....

10.

(4)

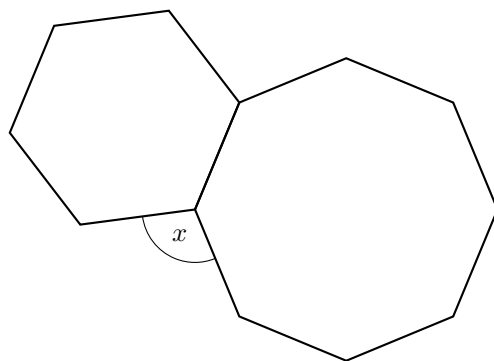


Diagram **NOT**  
accurately drawn

The diagram shows a regular hexagon and a regular octagon.

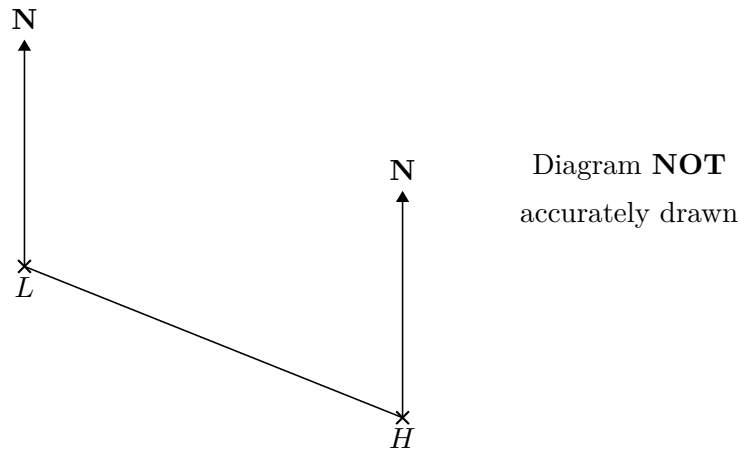
Calculate the size of the angle marked  $x$ .

You must show all your working.

.....°



11. The diagram shows the position of a lighthouse  $L$  and a harbour  $H$ . (4)



The scale of the diagram is 1 cm represents 5 km

- (a) Work out the real distance between  $L$  and  $H$ .

-----km

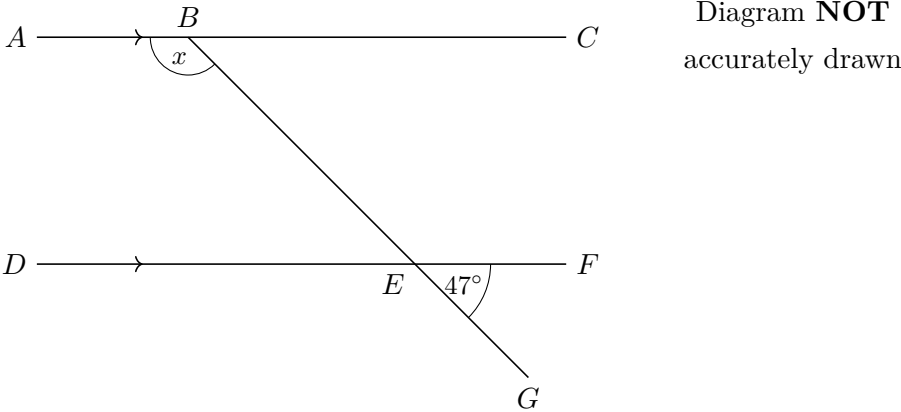
- (b) Measure the bearing of  $H$  from  $L$ .

-----°

A boat  $B$  is 20 km from  $H$  on a bearing of  $40^\circ$

- (c) On the diagram, mark the position of boat  $B$  with a cross ( $\times$ ). Label it  $B$ .

12. (3)



$ABC$  and  $DEF$  are parallel lines.  $BEG$  is a straight line. Angle  $GEF = 47^\circ$ .

Work out the size of the angle marked  $x$ .

Give reasons for your answer.

-----°

13.

(3)

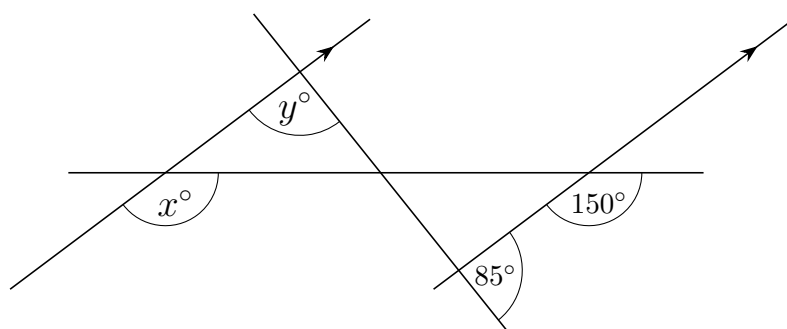


Diagram **NOT**  
accurately drawn

(a) Find the value of  $x$ .

(1)

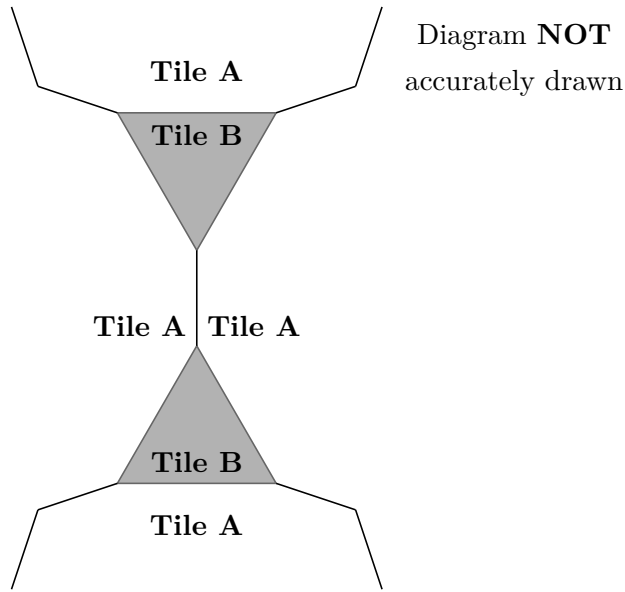
(b) Find the value of  $y$ . Give reasons for your answer.

(2)

14. The bearing of a ship from a lighthouse is  $050^\circ$ . Work out the bearing of the lighthouse from the ship.

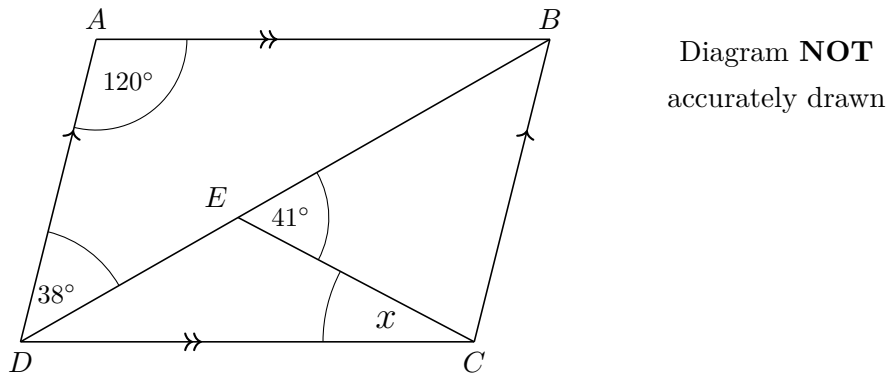
(2)

15. The diagram shows part of a pattern made from tiles. (4)



The pattern is made from two types of tiles, tile A and tile B.  
Both tile A and tile B are regular polygons. Work out the number of sides tile A has.

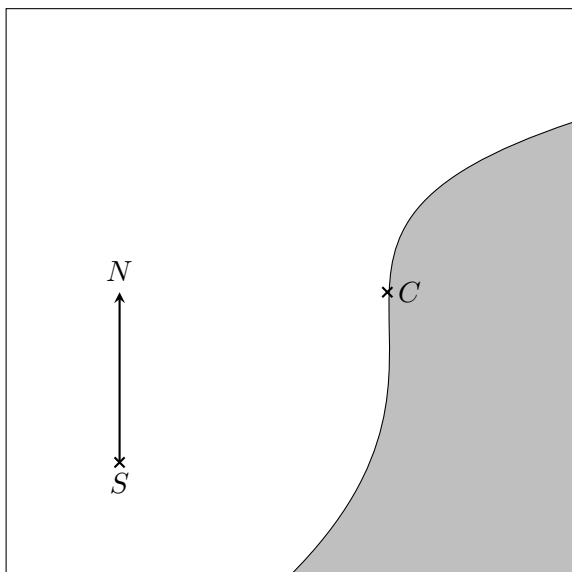
16. (4)



$ABCD$  is a parallelogram. Angle  $ADB = 38^\circ$ . Angle  $BEC = 41^\circ$ . Angle  $DAB = 120^\circ$ .  
Calculate the size of angle  $x$ . You must give reasons for your answer.

17. Here is a map. The position of a ship,  $S$ , is marked on the map.

(3)



Scale 1 cm represents 100 m.

Point  $C$  is on the coast. Ships must not sail closer than 500 m to point  $C$ .

The ship sails on a bearing of  $037^\circ$

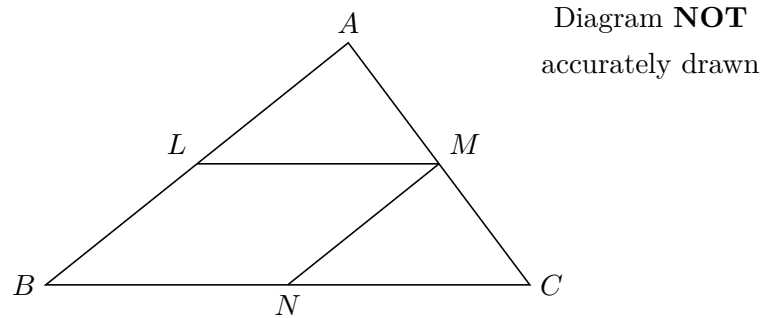
Will the ship sail closer than 500 m to point  $C$ ?

You must explain your answer.

## Chapter 4

# Congruent Triangle Proofs

1.



The diagram shows a triangle  $ABC$ .

$LMNB$  is a parallelogram where  $L$  is the midpoint of  $AB$ ,  $M$  is the midpoint of  $AC$ , and  $N$  is the midpoint of  $BC$ .

Prove that triangle  $ALM$  and triangle  $MNC$  are congruent. You must give reasons for each stage of your proof.

2.

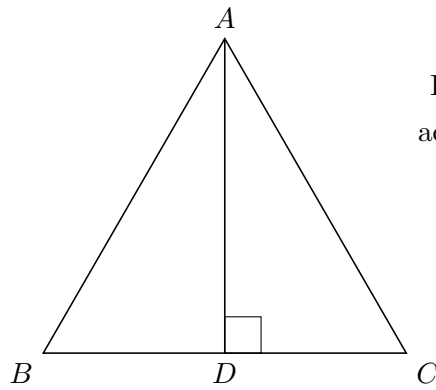


Diagram **NOT**  
accurately drawn

$ABC$  is an equilateral triangle.  $D$  lies on  $BC$ .  $AD$  is perpendicular to  $BC$ .

(a) Prove that triangle  $ADC$  is congruent to triangle  $ADB$ . (3)

(b) Hence, prove that  $BD = \frac{1}{2}AD$ . (2)

3.

(3)

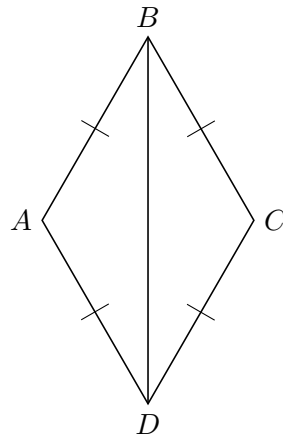


Diagram **NOT**  
accurately drawn

In the diagram,  $AB = BC = CD = DA$ .

Prove that the triangle  $ADB$  is congruent to triangle  $CDB$ .

4.

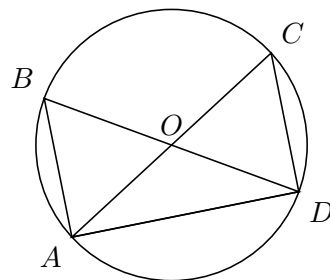
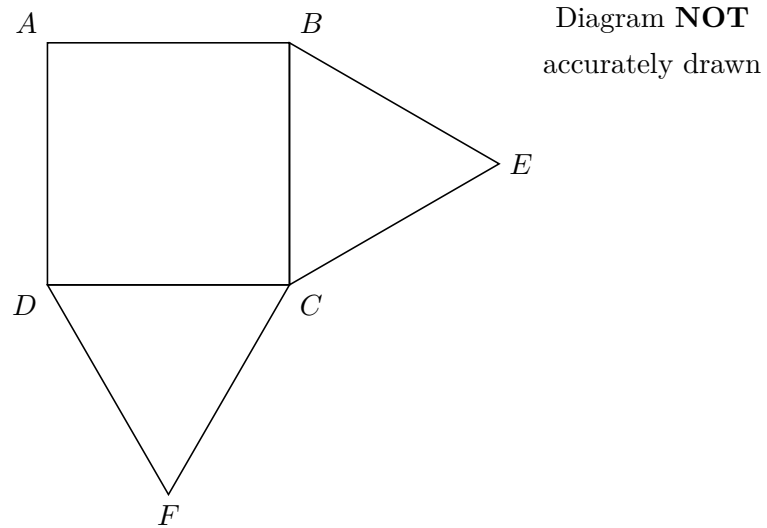


Diagram **NOT**  
accurately drawn

$AOC$  and  $BOD$  are diameters of a circle, centre  $O$ . Prove that triangle  $ABD$  and triangle  $DCA$  are congruent.

5.



$ABCD$  is a square.  $BEC$  and  $DCF$  are equilateral triangles.

(a) Prove that triangle  $ECD$  is congruent to triangle  $BFC$ . (3)

$G$  is the point such that  $BEGF$  is a parallelogram.

(b) Prove that  $ED = EG$ .

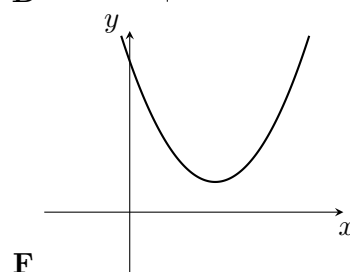
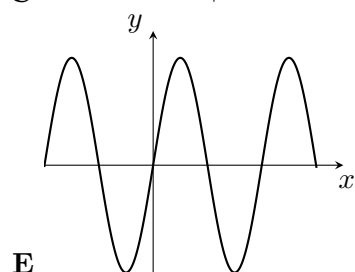
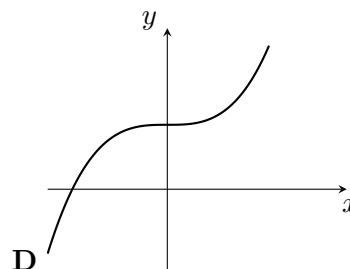
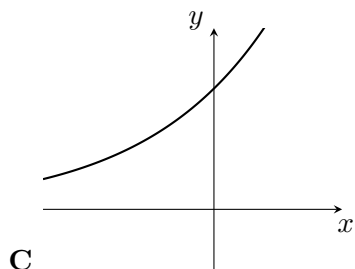
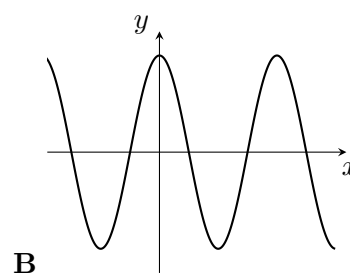
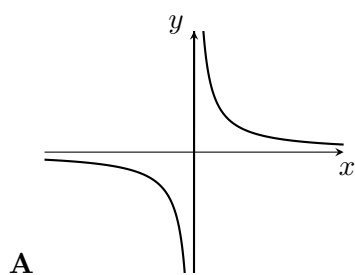


## Chapter 5

# GCSE Revision: Functions and Function Transformation Questions

1.

(3)

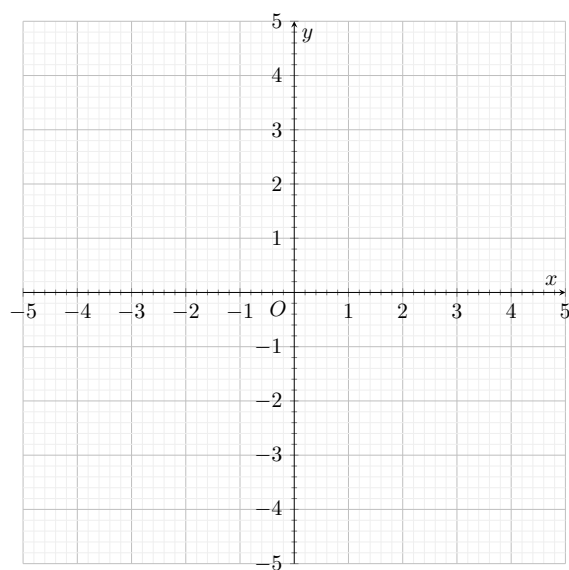


Each equation in the table represents one of the graphs **A** to **F**.

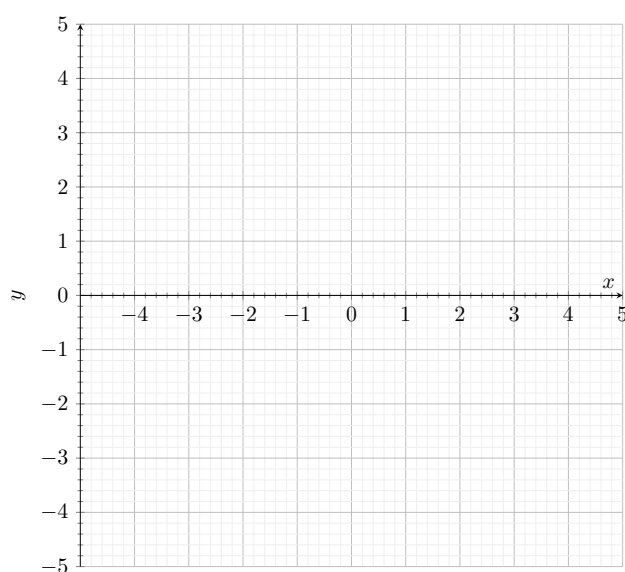
Write the letter of each graph in the correct place in the table.

Equation	Graph
$y = 4 \sin x^\circ$	
$y = 4 \cos x^\circ$	
$y = x^2 - 4x + 5$	
$y = 4 \times 2^x$	
$y = x^3 + 4$	

2.



(a) On the grid, draw the graph of  $x^2 + y^2 = 4$ . (2)

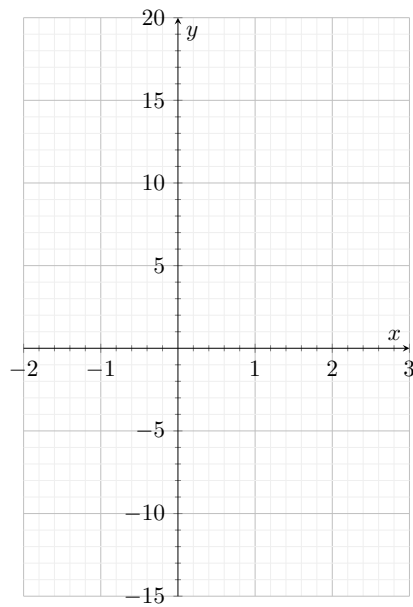


(b) On the grid, sketch the graph of  $y = \cos x$  for  $0^\circ \leq x \leq 360^\circ$ . (2)

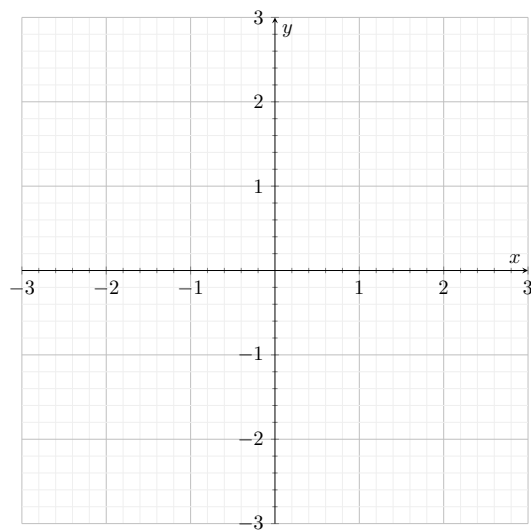
3. (a) Complete the table of values for  $y = x^3 - 7$ . (2)

$x$	-2	-1	0	1	2	3
$y$	-8					20

- (b) On the grid, draw the graph of  $y = x^3 - 7$  for values of  $x$  from  $-2$  to  $3$ . (2)



4. (a) Construct the graph of  $x^2 + y^2 = 9$ .



- (b) By drawing the line  $x + y = 1$  on the grid, solve the equations

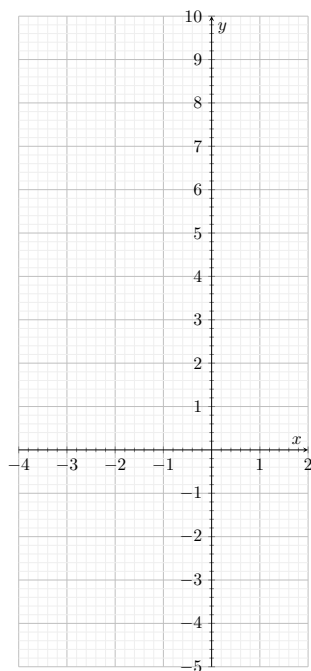
$$x^2 + y^2 = 9$$

$$x + y = 1$$

5. (a) Complete the table of values for  $y = x^2 + x - 3$ . (2)

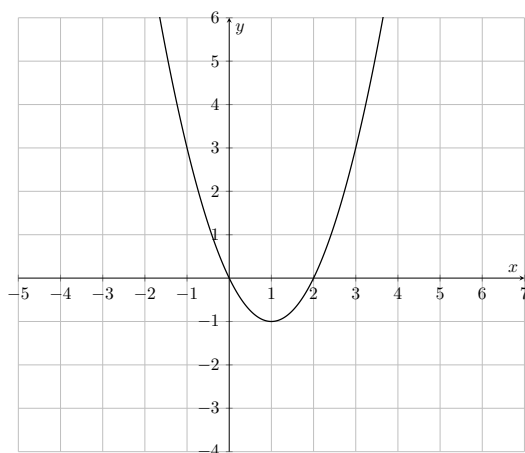
$x$	-4	-3	-2	-1	0	1	2
$y$	9		-1	-3			3

- (b) On the grid below, draw the graph of  $y = x^2 + x - 3$  for values of  $x$  from  $-4$  to  $2$ . (2)

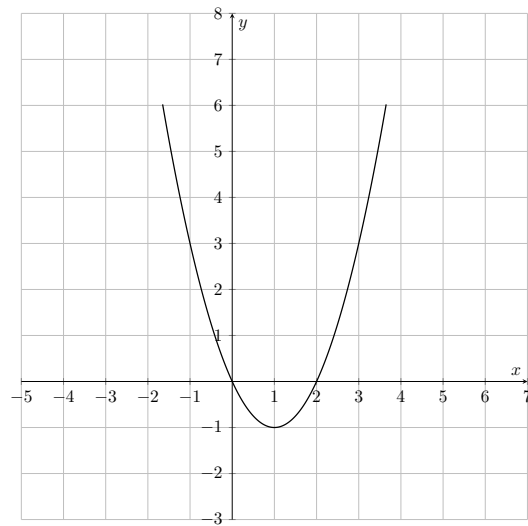


6. The graph of  $y = f(x)$  is shown on each of the grids.

- (a) On this grid, sketch the graph of  $y = f(x - 3)$ . (2)

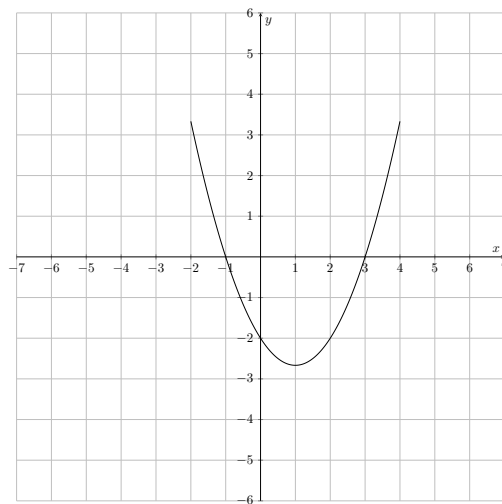


- (b) On this grid, sketch the graph of  $y = 2f(x)$ . (2)

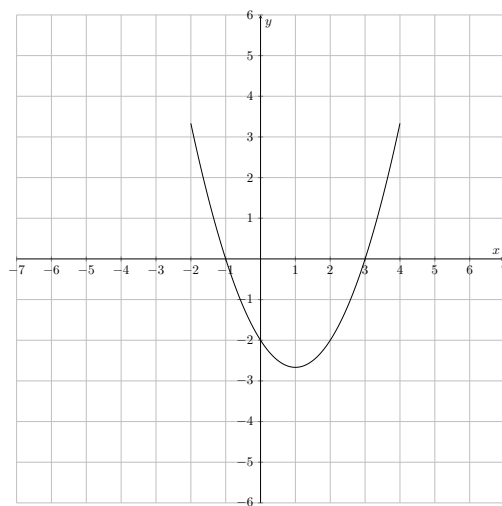


7. The graph of  $y = f(x)$  is shown on the grids.

(a) On this grid, sketch the graph of  $y = f(x - 3)$ . (2)



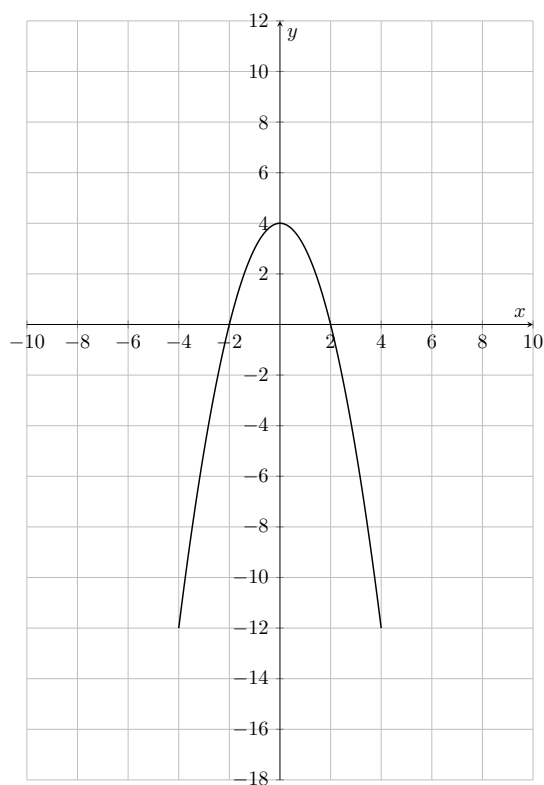
(b) On this grid, sketch the graph of  $y = -f(x)$ . (2)



8. The graph of  $y = f(x)$  is shown on the grids.

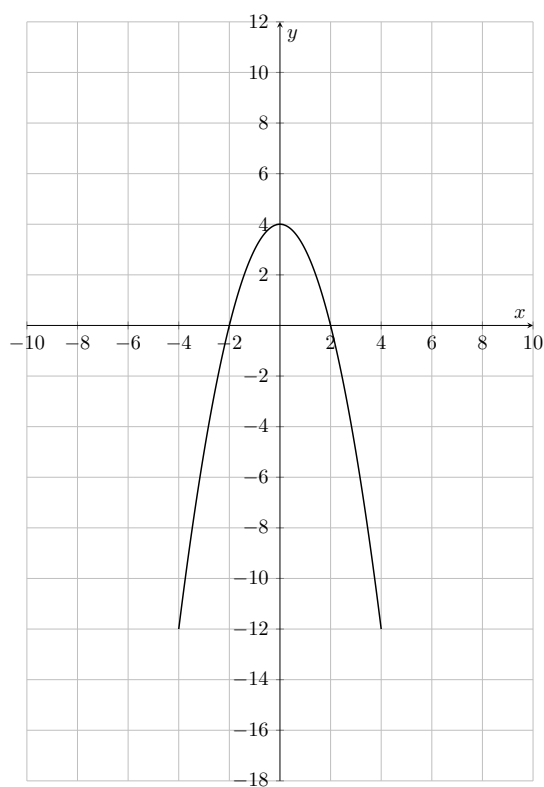
(a) On this grid, sketch the graph of  $y = f(x) - 4$ .

(2)



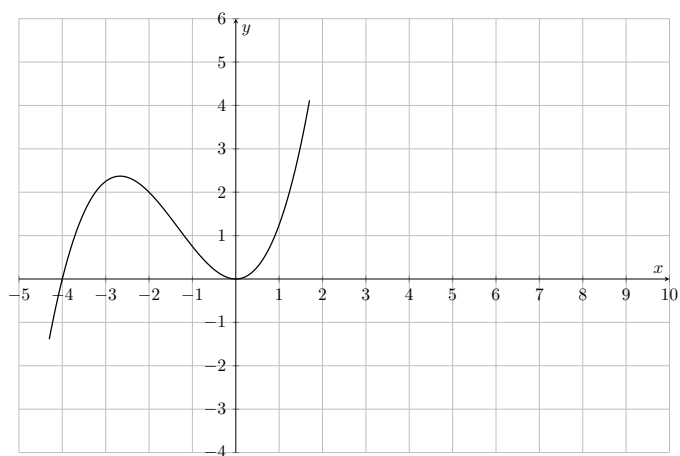
(b) On this grid, sketch the graph of  $y = f(\frac{1}{2}x)$ .

(2)

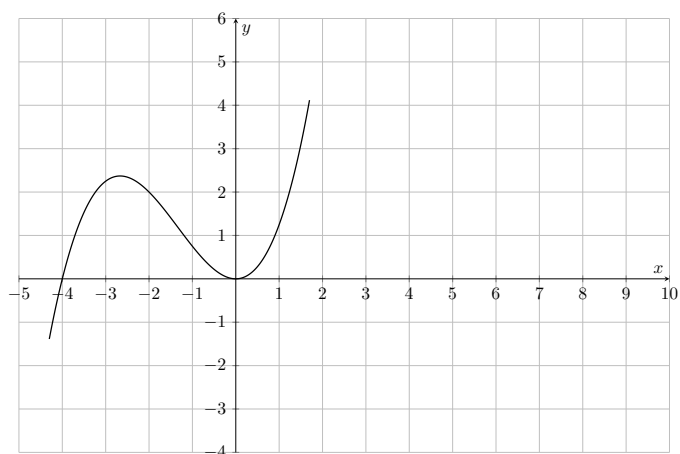


9. The graph of  $y = f(x)$  is shown on the grids.

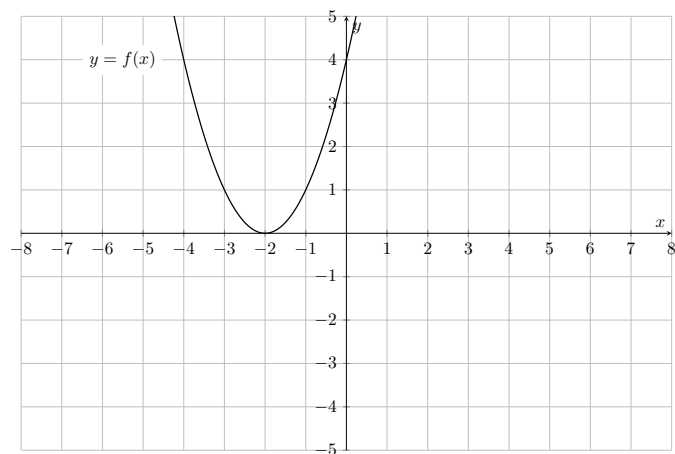
(a) On this grid, sketch the graph of  $y = f(x) + 2$ . (2)



(b) On this grid, sketch the graph of  $y = -f(x)$ . (2)

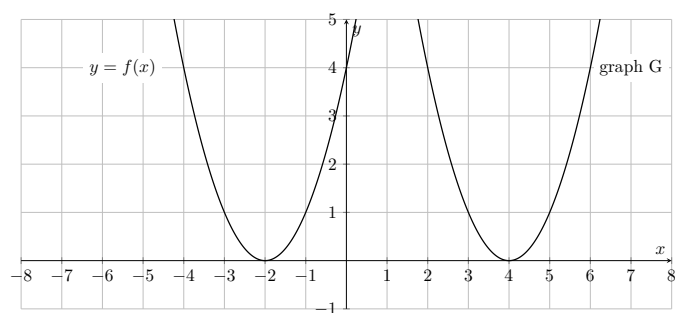


10. The graph of  $y = f(x)$  is shown on the grid.



(a) On the grid above, sketch the graph of  $y = -f(x)$ . (2)

The graph of  $y = f(x)$  is shown on the grid.



The graph **G** is a translation of the graph of  $y = f(x)$ .

(b) Write down the equation of graph **G**. (2)

11. The graph of  $y = f(x)$  is shown on the grid.



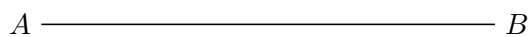
## Chapter 6

# GCSE Revision - Loci and Constructions

1. Draw the locus of all points which are equidistant from the lines  $AB$  and  $AC$ . (2)



2. Use ruler and compasses to **construct** the perpendicular bisector of the line  $AB$ . You must show all your construction line. (2)

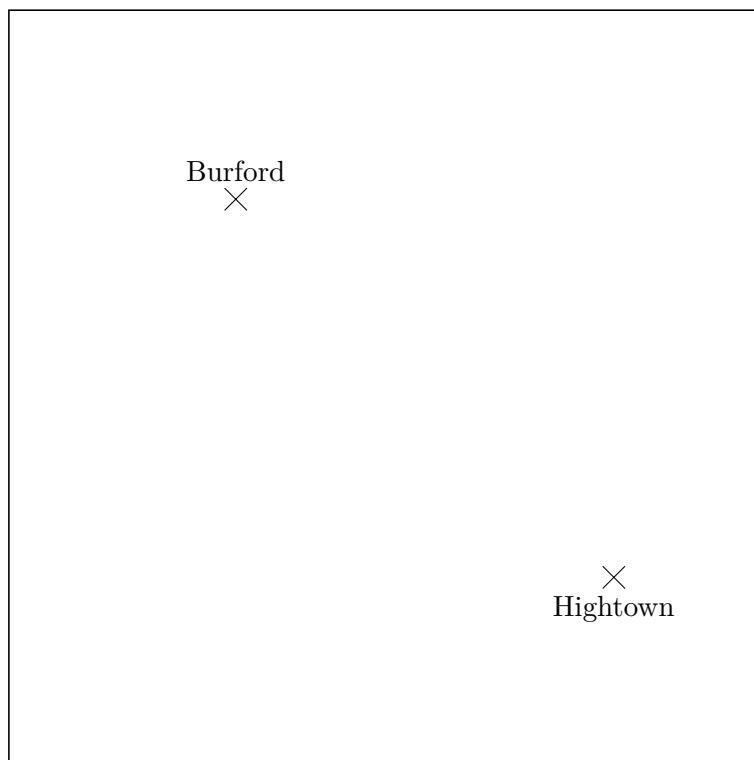


3. Use ruler and compasses to **construct** an angle of  $30^\circ$  at  $P$ . You must show all your construction lines. (3)

$P$  \_\_\_\_\_

4. Here is a map.

The map shows two towns, Burford and Hightown



Scale: 1 cm represents 10 km.

A company is going to build a warehouse. The warehouse will be less than 30 km from Burford and less than 50 km from Hightown. Shade the region on the map where the company can build the warehouse. (3)

5. Here is a scale drawing of a rectangular garden  $ABCD$ . (4)



Scale: 1 cm represents 1 metre.

Jane wants to plant a tree in the garden at least 5m from point  $C$ , nearer to  $AB$  than to  $AD$ , and less than 3m from  $DC$ .

On the diagram, shade the region where Jane can plant the tree.



## Chapter 7

# GCSE Revision - Number Questions

Standard Form, Bounds, Percentages, Direct/Indirect Proportion, Fractions, Line Graphs, LCM.

1. (a) Write  $7.8^{-4}$  as an ordinary number. (1)

- (b) Write 95600000 as a number in standard form. (1)

-----  
**Total for Question 1 is 2 marks**

2. In a sale normal prices are reduced by 20%. A washing machine has a sale price of £464.  
By how much money is the normal price of the washing machine reduced? (3)

£-----

3.  $y$  is directly proportional to the square of  $x$ . When  $x = 3$ ,  $y = 36$ . Find the value of  $y$  when  $x = 5$ . (4)

-----

4.

$$m = \frac{\sqrt{s}}{t}$$

$s = 3.47$  correct to 2 decimal places.

$t = 8.132$  correct to 3 decimal places.

By considering bounds, work out the value of  $m$  to a suitable degree of accuracy. You must show all your working and give a reason for your final answer.

5. (a) Write  $8.2 \times 10^5$  as an ordinary number. (1)

-----

- (b) Write 0.000376 in standard form. (1)

-----

- (c) Work out the value of  $(2.3 \times 10^{12}) \div (4.6 \times 10^3)$ . Give your answer in standard form. (2)

-----

**Total for Question 5 is 4 marks**

6.  $h$  is inversely proportional to the square of  $r$ . When  $r = 5$ ,  $h = 3.4$ . Find the value of  $h$  when  $r = 8$ . (3)

$h =$ \_\_\_\_\_

7. Dan does an experiment to find the value of  $\pi$ . He measures the circumference and the diameter of a circle. He measures the circumference,  $C$ , as 170 mm to the nearest millimetre. He measures the diameter,  $d$ , as 54 mm to the nearest millimetre.

Dan uses  $\pi = \frac{C}{d}$  to find the value of  $\pi$ . Calculate the upper bound and the lower bound for Dan's value of  $\pi$ . (4)

upper bound = \_\_\_\_\_

lower bound = \_\_\_\_\_

8. Viv wants to invest £2000 for 2 years in the same bank.

<b>The International Bank</b>
Compound Interest
4% for the first year
1% for each extra year

<b>The Friendly Bank</b>
Compound Interest
5% for the first year
0.5% for each extra year

At the end of 2 years, Viv wants to have as much money as possible. Which bank should she invest her £2000 in? (4)

9. One sheet of paper is  $9 \times 10^{-3}$  cm thick. Mark wants to put 500 sheets of paper into the paper tray of his printer. The paper tray is 4 cm deep.

Is the paper tray deep enough for 500 sheets of paper? You must explain your answer. **(3)**

10. The normal price of a television is reduced by 30% in a sale. The sale price of the television is £350 Work out the normal price of the television. **(3)**

£ .....

11. Write the following numbers in order of size. Start with the smallest number. **(2)**

$$0.038 \times 10^2 \quad 3800 \times 10^{-4} \quad 380 \quad 0.38 \times 10^{-1}$$

12. Talil is going to make some concrete mix. He needs to mix cement, sand and gravel in the ratio 1 : 3 : 5 by weight.

Talil wants to make 180 kg of concrete mix. Talil has

15 kg of cement

85 kg of sand

100 kg of gravel

Does Talil have enough cement, sand and gravel to make the concrete mix? **(4)**



13. Work out an estimate for  $\frac{31 \times 9.87}{0.509}$ . (3)

14. The average fuel consumption ( $c$ ) of a car, in kilometres per litre, is given by the formula

$$c = \frac{d}{f}$$

where  $d$  is the distance travelled, in kilometres, and  $f$  is the fuel used, in litres.

$d = 163$  correct to 3 significant figures.

$f = 45.3$  correct to 3 significant figures.

By considering bounds, work out the value of  $c$  to a suitable degree of accuracy. You must show all of your working and give a reason for your final answer. (5)

$c = \dots\dots\dots$

15. (a) Write  $6.43 \times 10^5$  as an ordinary number. (1)

$\dots\dots\dots$

- (b) Work out the value of  $2 \times 10^7 \times 8 \times 10^{-12}$  Give your answer in standard form. (2)

$\dots\dots\dots$

- 16.

$$p^2 = \frac{x - y}{xy}$$

$$x = 8.5 \times 10^9$$

$$y = 4 \times 10^8$$

Find the value of  $p$ . Give your answer in standard form correct to 2 significant figures. (3)

-----

17. Liam invests £6200 for 3 years in a savings account. He gets 2.5% per annum compound interest.

How much money will Liam have in his savings account at the end of 3 years? (3)

£-----

18. Express the recurring decimal  $0.2\dot{8}\dot{1}$  as a fraction in its simplest form. (3)

-----

19. (a) Write down the value of  $10^0$ . (1)

-----

(b) Write  $6.7 \times 10^{-5}$  as an ordinary number. (1)

-----

(c) Work out the value of  $(3 \times 10^7) \times (9 \times 10^6)$ . Give your answer in standard form. (2)

-----

**Total for Question 19 is 4 marks**

20. (a) Work out the value of  $(6 \times 10^8) \times (4 \times 10^7)$ . Give your answer in standard form. (2)

-----

(b) Work out the value of  $(6 \times 10^8) + (4 \times 10^7)$ . Give your answer in standard form. (2)

-----

21. Use your calculator to work out

$$\sqrt{\frac{921 - 170 \tan 65^\circ}{0.012 + 0.034}}$$

- (a) Write down all the figures on your calculator display. You must write your answer as a decimal. (2)

-----

22. (a) Write 82500000 in standard form. (1)

-----

- (b) Work out  $(5.2 \times 10^{-7}) \times (2.8 \times 10^{-9})$ . Give your answer in standard form. (2)

-----

23.  $P$  is inversely proportional to  $V$ . When  $V = 8$ ,  $P = 5$

- (a) Find a formula for  $P$  in terms of  $V$ . (3)

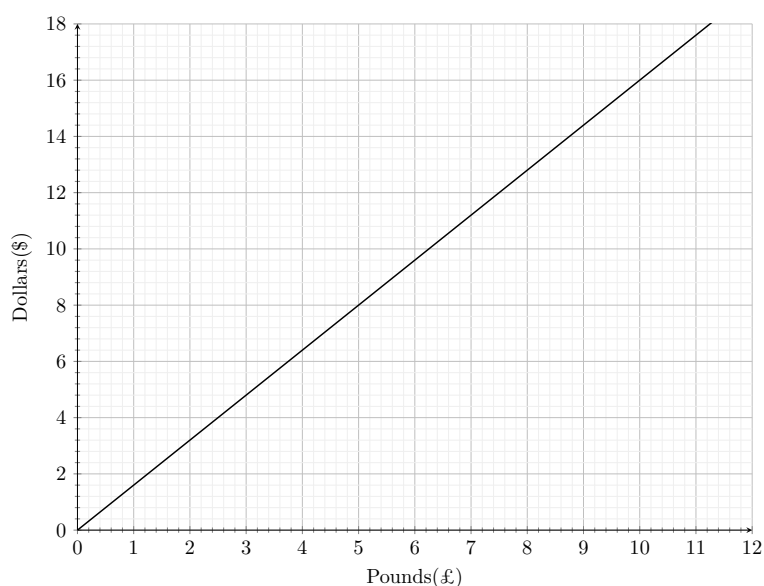
-----

- (b) Calculate the value of  $P$  when  $V = 2$ . (1)

-----

24. Work out  $1.83 \times 47$ .

25. You can use this conversion graph to change between pounds (£) and dollars (\$).



- (a) Use the conversion graph to change £5 to dollars. (1)

\$.....

Ella has \$200 and £800. Her hotel bill is \$600. Ella pays the bill with the \$200 and some of the pounds

- (b) Use the conversion graph to work out how many pounds she has left. (4)

£.....

**Total for Question 25 is 4 marks**

26. Trams leave Piccadilly

to Eccles every 9 minutes

to Didsbury every 12 minutes

A tram to Eccles and a tram to Didsbury both leave Piccadilly at 9 a.m. At what time will a tram to Eccles and a tram to Didsbury next leave Piccadilly at the same time? (3)

.....

27. Given that  $1793 \times 185 = 331705$ . Write down the value of

(a)  $1.793 \times 185$

-----

(b)  $331705 \div 1.85$

-----

**Total for Question 27 is 2 marks**

28. Write 525 as a product of its prime factors. **(3)**

-----

29. Ed has 4 cards. There is a number on each card.

12

6

15

?

The mean of the 4 numbers on Ed's cards is 10. Work out the number on the 4th card.

**(3)**

-----

30. Here are the ingredients needed to make 12 shortcakes.

Shortcakes
Makes <b>12</b> shortcakes
50 g of sugar
200 g of butter
200 g of flour
10 ml of milk

Liz makes some shortcakes. She uses 25 ml of milk.

- (a) How many shortcakes does Liz make? (2)

-----

Robert has

- 500 g of sugar
- 1000 g of butter
- 1000 g of flour
- 500 ml of milk

- (b) Work out the greatest number of shortcakes Robert can make. (2)

-----

**Total for Question 30 is 4 marks**

31. Buses to Acton leave a bus station every 24 minutes. Buses to Barton leave the same bus station every 20 minutes. A bus to Acton and a bus to Barton both leave the bus station at 9:00 am.

When will a bus to Acton and a bus to Barton next leave the bus station at the same time? (3)

-----

32. Work out an estimate for the value of  $(0.49 \times 0.61)^2$ . (2)

-----

33. (a) Work out  $\frac{2}{3} \div \frac{5}{6}$ . Give your fraction in its simplest form. (3)

-----

- (b) Work out  $2\frac{1}{3} - 1\frac{2}{5}$ . (3)

-----

**Total for Question 33 is 6 marks**

34. (a) Work out  $2\frac{17}{20} - 1\frac{2}{5}$ . (3)

-----

- (b) Work out  $2\frac{2}{3} \times 1\frac{3}{4}$ . (3)

-----

**Total for Question 34 is 6 marks**

35. Work out  $3\frac{1}{4} \times 2\frac{2}{3}$ . Give your answer in its simplest form. (3)

-----

36. The diagram shows the floor of a village hall.

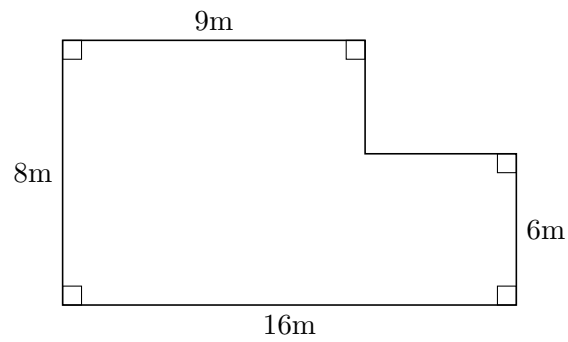


Diagram **NOT**  
accurately drawn

The caretaker needs to polish the floor.

One tin of polish normally costs £19.

One tin of polish covers  $12\text{ m}^2$  of floor.

There is a discount of 30% off the cost of the polish. The caretaker has £130.

Has the caretaker got enough money to buy the polish for the floor? You must show all your working.



## Chapter 8

# GCSE Revision - Probability

1. In a supermarket, the probability that John buys fruit is 0.7. In the same supermarket, the probability that John independently buys vegetables is 0.4.

Work out the probability that John buys fruit or buys vegetables or buys both. **(4)**

-----

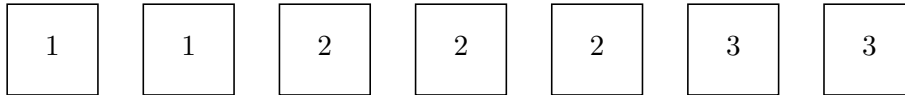
2. There are three different types of sandwiches on a shelf. There are 4 egg sandwiches, 5 cheese sandwiches and 2 ham sandwiches. Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.

3. Fiza has 10 coins in a bag. There are three £1 coins and seven 50 pence coins. Fiza takes at random, 3 coins from the bag.

Work out the probability that she takes exactly £2.50.

4. Here are seven tiles.



Jim takes at random a tile.

He does **not** replace the tile.

Jim then takes at random a second tile.

- (a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

(2)

-----

- (b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.

5. Carolyn has 20 biscuits in a tin. She has

12 plain biscuits

5 chocolate biscuits

3 ginger biscuits

Carolyn takes at random two biscuits from the tin. Work out the probability that the two biscuits were not the same type.

6. Jan has two boxes.

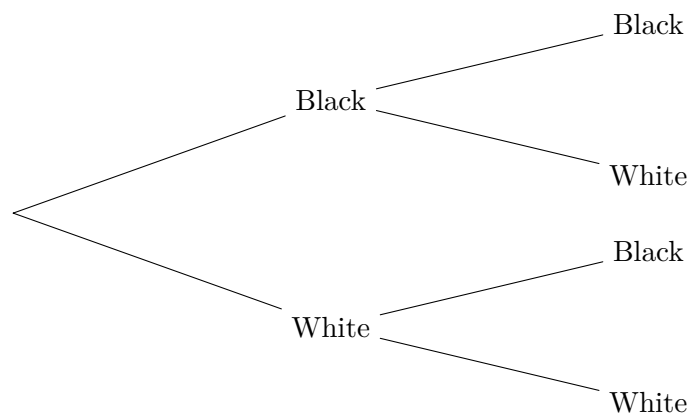
There are 6 black and 4 white counters in box A.

There are 7 black and 3 white counters in box B.

Jan takes at random a counter from box A and puts it in box B.

She then takes at random a counter from box B and puts it in box A.

- (a) Complete the probability tree diagram. (2)



- (b) Find the probability that after Jan has put the counter from box B into box A there will still be 6 black counters and 4 white counters in box A. (2)

-----

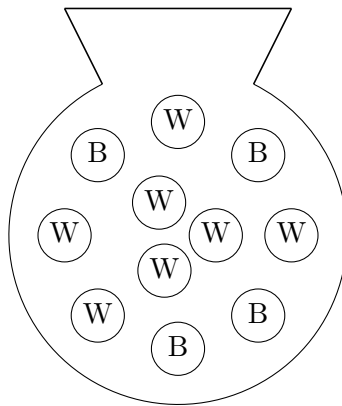
7. There are 5 red pens, 3 blue pens and 2 green pens in a box.

Gary takes at random a pen from the box and gives the pen to his friend.

Gary then takes at random another pen from the box.

Work out the probability that both pens are the same color.

8.



There are 11 buttons in a bag.

7 buttons are white.

4 buttons are black.

Harley takes a button at random from the bag, and keeps it.

She now takes another button at random from the bag.

Work out the probability that Harley takes a button of each color.

## Chapter 9

# GCSE Questions - Right-Angled Triangles

1.  $ABC$  is an isosceles triangle.

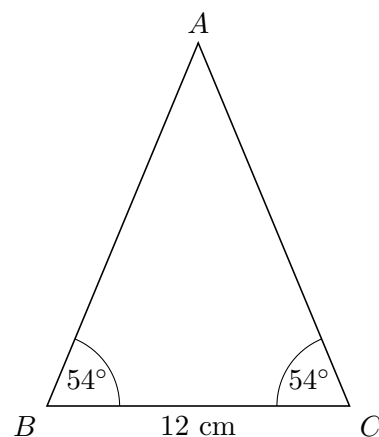


Diagram **NOT**  
accurately drawn

Work out the area of the triangle. Give your answer correct to 3 significant figures. (4)

..... $\text{cm}^2$

2. Here is a right-angled triangle.

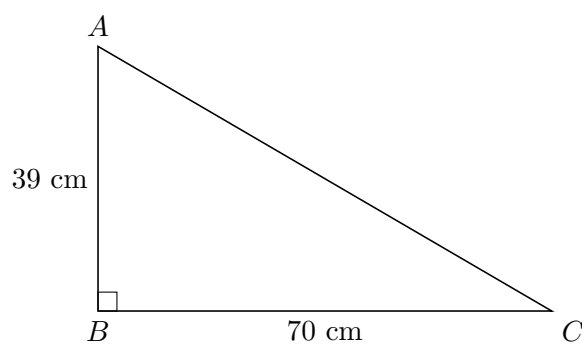


Diagram **NOT**  
accurately drawn

Work out the length of  $AC$ . Give your answer correct to 1 decimal place. (3)

-----cm

- 3.

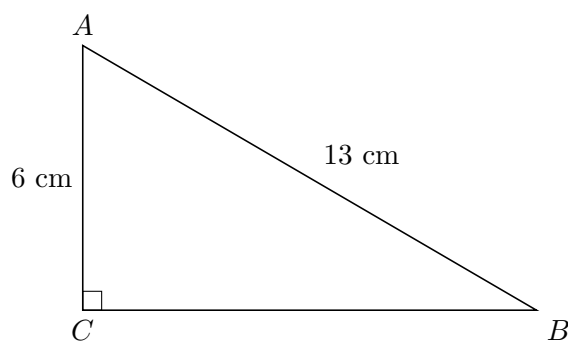


Diagram **NOT**  
accurately drawn

$ABC$  is a right-angled triangle.

$$AC = 6 \text{ cm}$$

$$AB = 13 \text{ cm}$$

- (a) Work out the length of  $BC$ . Give your answer correct to 3 significant figures. (3)

-----cm

(b)

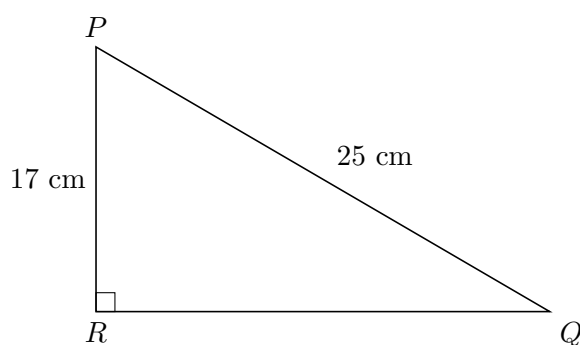


Diagram **NOT**  
accurately drawn

PQR is a right-angled triangle.

$$PR = 17 \text{ cm}$$

$$PQ = 25 \text{ cm}$$

Work out the size of angle RPQ. Give your answer correct to 1 decimal place. (3)

-----°

4. The diagram shows a ladder leaning against a vertical wall.

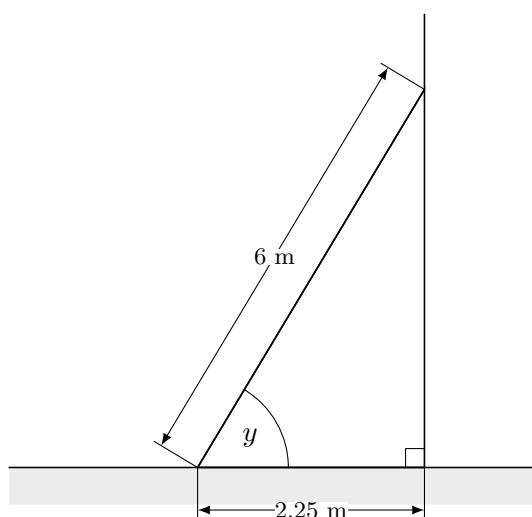


Diagram **NOT**  
accurately drawn

The ladder stands on horizontal ground. The length of the ladder is 6 m. The bottom of the ladder is 2.25 m from the bottom of the wall. A ladder is safe to use when the angle marked  $y$  is about  $75^\circ$ .

Is the ladder safe to use? You must show all your working. (4)

5.  $XYZ$  is a right-angled triangle.

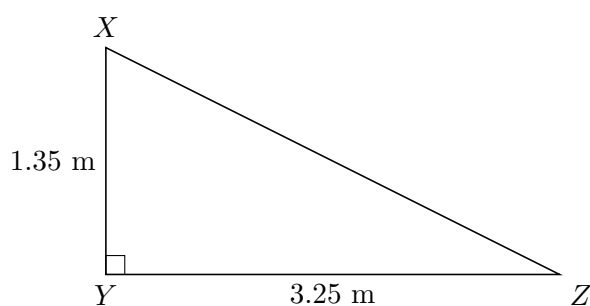


Diagram **NOT**  
accurately drawn

Calculate the length of  $XZ$ . Give your answer correct to 3 significant figures. **(3)**

.....m

- 6.

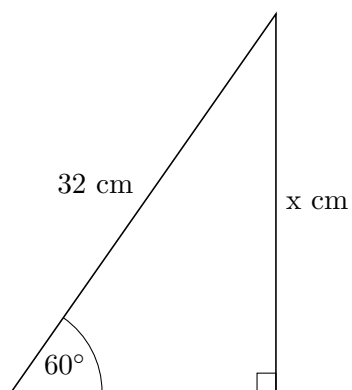


Diagram **NOT**  
accurately drawn

Calculate the value of  $x$ . Give your answer correct to 3 significant figures. **(3)**

.....



7.  $ABCD$  is a trapezium

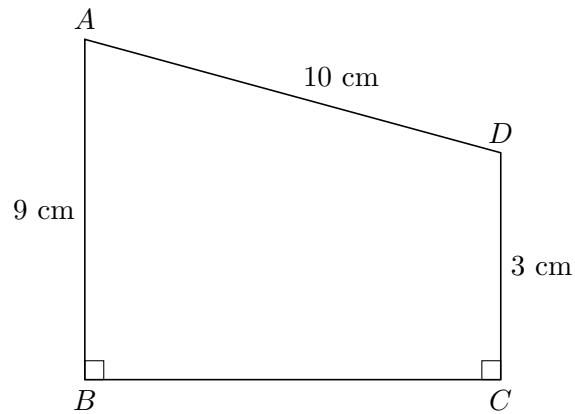


Diagram **NOT**  
accurately drawn

$$AD = 10 \text{ cm}$$

$$AB = 9 \text{ cm}$$

$$DC = 3 \text{ cm}$$

Angle  $ABC = \text{angle } BCD = 90^\circ$  Calculate the length of  $AC$ . Give your answer correct to 3 significant figures. (5)

-----cm

8. (a)  $PQR$  is a right-angled triangle.

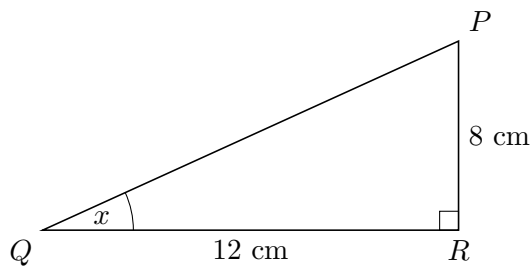


Diagram **NOT**  
accurately drawn

$$PR = 8 \text{ cm.}$$

$QR = 12 \text{ cm}$  Find the size of the angle marked  $x$ . Give your answer correct to 1 decimal place. (3)

----- $^\circ$

(b)  $XYZ$  is a different right-angled triangle.

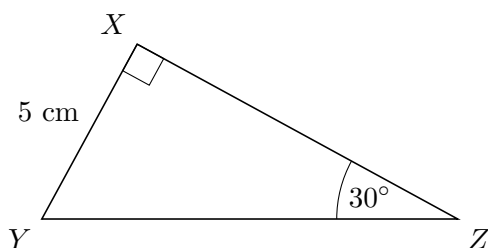


Diagram **NOT**  
accurately drawn

$XY = 5$  cm. Angle  $Z = 32^\circ$ .

Calculate the length  $YZ$ . Give your answer correct to 3 significant figures. (3)

.....cm

9.

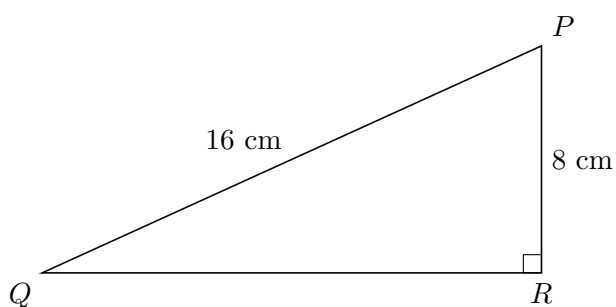


Diagram **NOT**  
accurately drawn

$PQR$  is a right-angled triangle.

$PQ = 16$  cm.  $PR = 8$  cm.

Calculate the length of  $QR$ . Give your answer correct to 2 decimal places. (3)

.....cm

10. The diagram shows a quadrilateral  $ABCD$ .

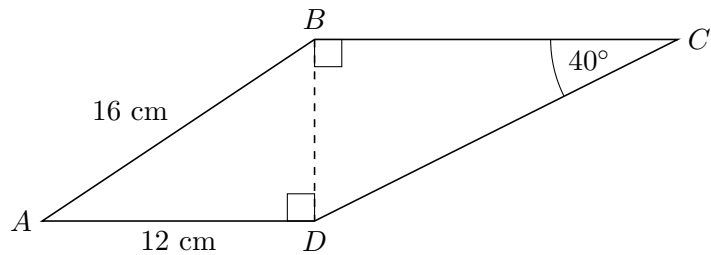


Diagram **NOT**  
accurately drawn

$AB = 16 \text{ cm}$ .  $AD = 12 \text{ cm}$ . Angle  $BCD = 40^\circ$ . Angle  $ADB = \text{angle } CBD = 90^\circ$ .

Calculate the length of  $CD$ . Give your answer correct to 3 significant figures. **(5)**

.....cm

11.

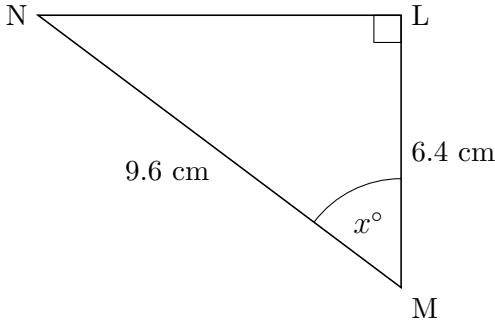


Diagram **NOT**  
accurately drawn

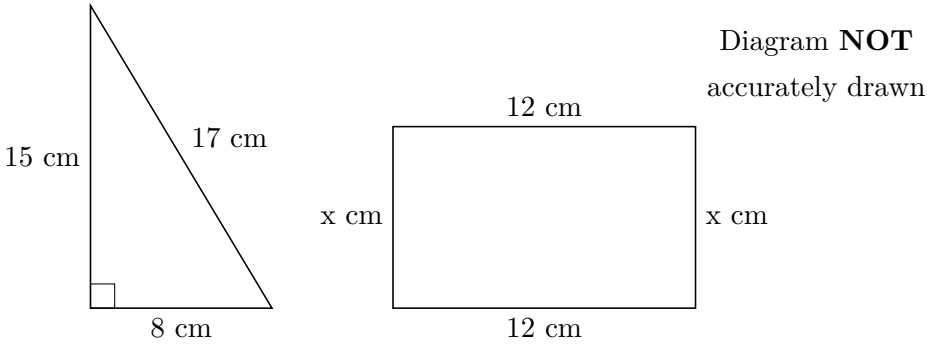
$LMN$  is a right-angled triangle.  $MN = 9.6 \text{ cm}$ .  $LM = 6.4 \text{ cm}$ .

Calculate the size of the angle marked  $x^\circ$ . Give your answer correct to 1 decimal place.

**(3)**

.....cm

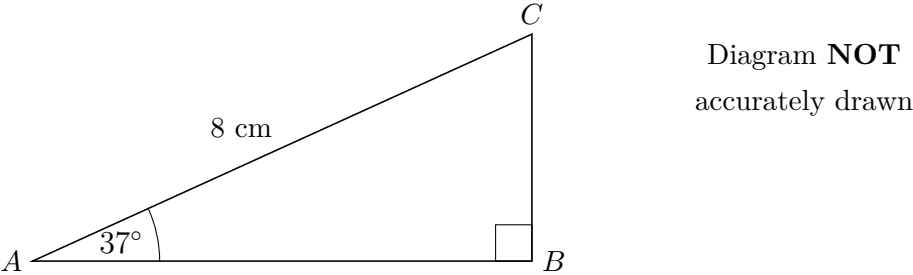
12. The diagrams show a right-angled triangle and a rectangle



The area of the right-angled triangle is equal to the area of the rectangle. Find the value of  $x$ . (4)

$x = \dots\dots\dots$

13.

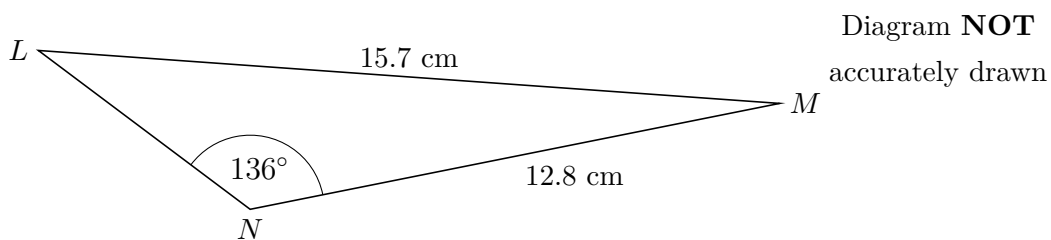


$ABC$  is a right-angled triangle.  
 $AC = 8$  m.  
 Angle  $CAB = 37^\circ$ .

Calculate the length of  $AB$ . Give your answer correct to 3 significant figures. (3)

$\dots\dots\dots$  m.

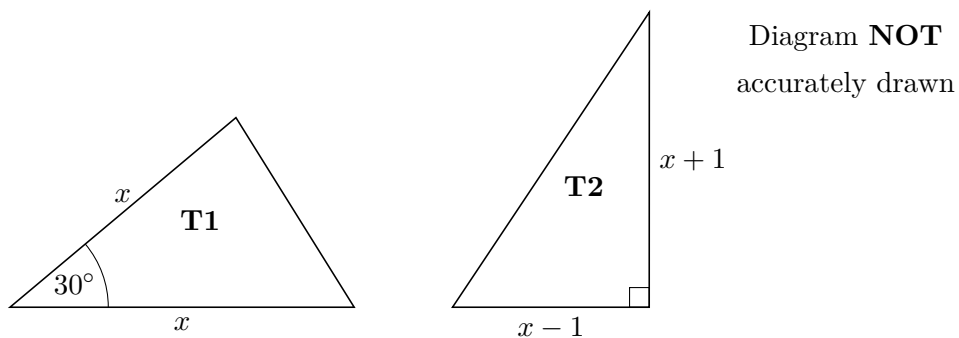
14. The diagram shows triangle  $LMN$ .



Calculate the length of  $LN$ . Give your answer correct to 3 significant figures. **(5)**

-----cm.

15. Here are two triangles **T1** and **T2**



The lengths of the sides are in centimetres. The area of triangle **T1** is equal to the area of triangle **T2**. Work out the value of  $x$ , giving your answer in the form  $a + \sqrt{x}$  where  $a$  and  $b$  are integers. **(5)**

16.

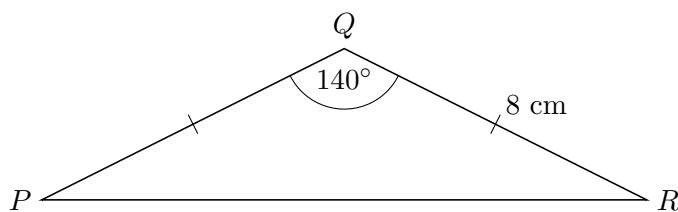


Diagram **NOT**  
accurately drawn

Calculate the length of  $PR$ . Give your answer correct to 3 significant figures. **(3)**

-----cm.

17.  $ABC$  is a triangle

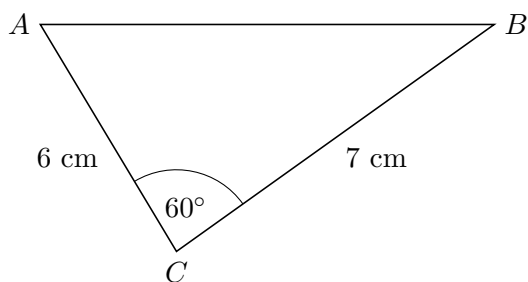


Diagram **NOT**  
accurately drawn

(a) Work out the area of triangle  $ABC$ . Give your answer correct to 3 significant figures.

**(2)**

-----cm<sup>2</sup>.

(b) Work out the length of the side  $AB$ . Give your answer correct to 3 significant figures.

**(2)**

-----cm.

18. The diagram shows the triangle  $PQR$ .

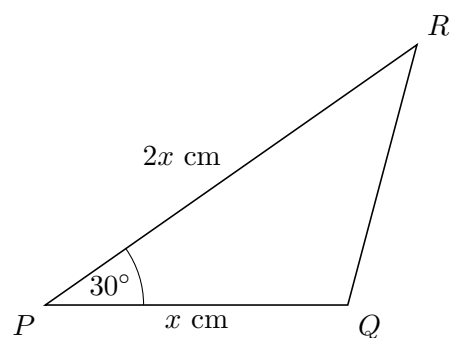


Diagram **NOT**  
accurately drawn

$PQ = x$  cm.  $PR = 2x$  cm. Angle  $QPR = 30^\circ$ . The area of triangle  $PQR = A$  cm<sup>2</sup>.

Show that  $x = \sqrt{2A}$ . (2)

19. Here is a triangle  $ABC$ .

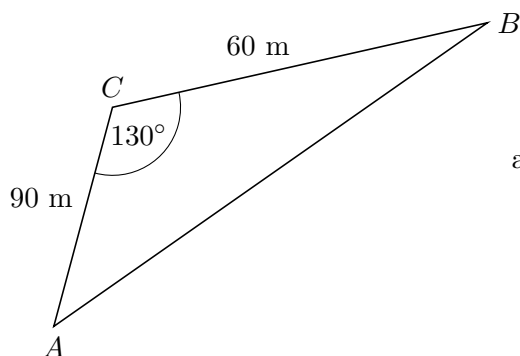


Diagram **NOT**  
accurately drawn

$AC = 90$  m.  $BC = 60$  m. Angle  $ACB = 130^\circ$ .

Calculate the perimeter of the triangle. Give your answer correct to one decimal place.

(4)

.....m.

20.

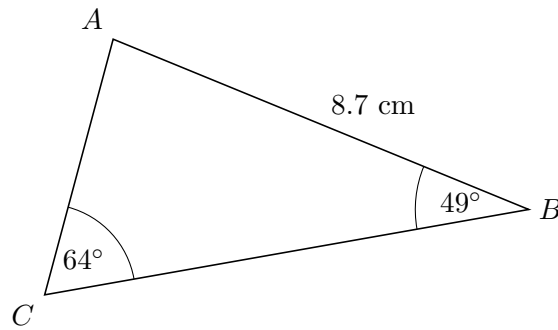


Diagram **NOT**  
accurately drawn

$ABC$  is a triangle.  $AB = 8.7$  cm. Angle  $ABC = 49^\circ$ . Angle  $ACB = 64^\circ$ .

Calculate the area of triangle  $ABC$ . Give your answer correct to 3 significant figures.(5)

.....cm<sup>2</sup>.

21.

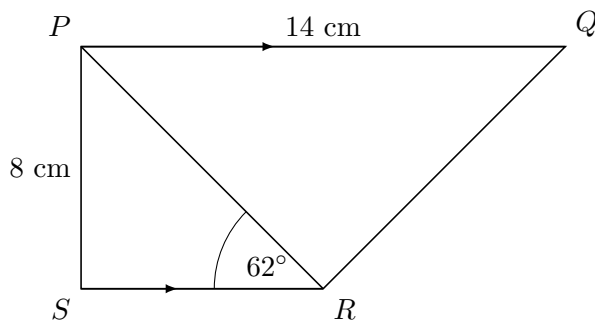


Diagram **NOT**  
accurately drawn

$PQRS$  is a trapezium.  $PQ$  is parallel to  $SR$ . Angle  $PSR = 90^\circ$ . Angle  $PRS = 62^\circ$ .

$PQ = 14$  cm.  $PS = 8$  cm.

(a) Work out the length of  $PR$ . Give your answer correct to 3 significant figures. (3)

.....cm.



- (b) Work out the length of  $QR$ . Give your answer correct to 3 significant figures. (3)

-----cm.

22.

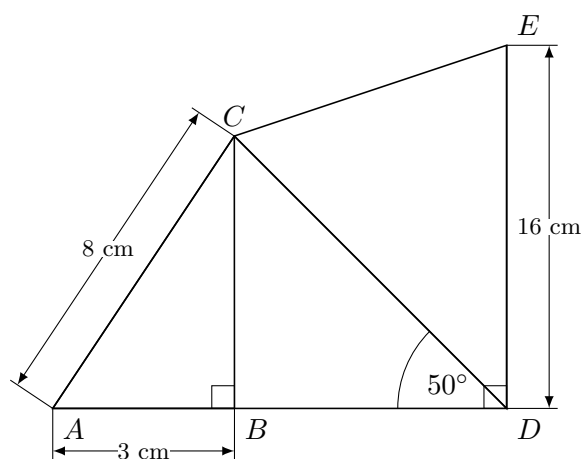


Diagram **NOT**  
accurately drawn

$$AC = 8 \text{ cm.}$$

$$AB = 3 \text{ cm.}$$

$$DE = 16 \text{ cm.}$$

$$\text{Angle } ABC = \text{angle } CBD = \text{angle } BDE = 90^\circ.$$

$$\text{Angle } BDC = 50^\circ.$$

- (a) Calculate the length of  $CD$ . Give your answer correct to 3 significant figures. (4)

-----cm.

- (b) Calculate the length of  $CE$ . Give your answer correct to 3 significant figures. (3)

-----cm.

23.

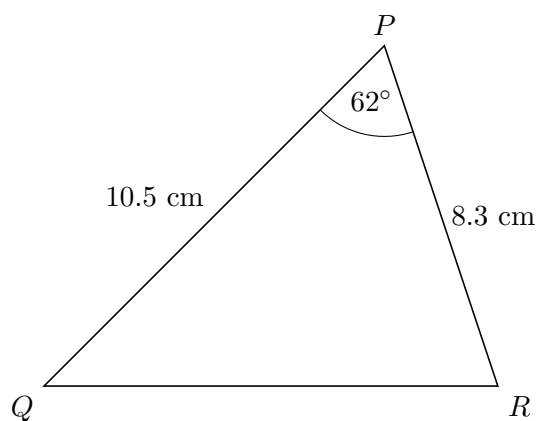


Diagram **NOT**  
accurately drawn

In triangle  $PQR$ ,

$PQ = 10.5\text{ cm}$ ,

$PR = 8.3\text{ cm}$ .

angle  $QPR = 62$ .

- (a) Calculate the area of triangle  $PQR$ . Give your answer correct to 3 significant figures.

**(2)**

----- .cm.

- (b) Calculate the area of triangle  $PQR$ . Give your answer correct to 3 significant figures.

**(3)**

----- .cm.

## Chapter 10

# GCSE Revision - Straight Line Equations

### 1. Finding a gradient

(a) What is the gradient of the line that goes through the points  $(1, 6)$  and  $(5, -3)$ .

(b) What is the gradient of the line  $x + 2y = 1$ ?

### 2. Finding the equation of the line given two points.

(a) Give the full equation of the line which goes through the points  $(3, 5)$  and  $(5, 11)$ .

(b) Give the full equation of the line which goes through the points  $(5, 1)$  and  $(8, -8)$ .

(c) Give the full equation of the line which has the gradient 4 and goes through the point  $(0, 3)$ .

(d) Give the equation of the line which has gradient 4 and goes through the point  $(3, 7)$ .

3. Finding the equation of a line parallel or perpendicular to another.

(a) Give the equation of the line which is parallel to  $y = 4x + 3$  and goes through the point  $(4, 5)$ .

(b) Give the equation of the line which is parallel to  $y = \frac{1}{3}x - 2$  and goes through the point  $(9, 5)$ .

(c) Give the equation of a line which is perpendicular to  $y = 2x + 1$ .

(d) Give the equation of the line which is perpendicular to  $y = 5x + 6$  and goes through the point  $(-15, 2)$ .

4. Finding where a line intercepts the  $x$  or  $y$  axis.

(a) The  $y$ -axis:

(b) The  $x$ -axis:

5. At what point does  $y = 3x - 2$  intercept:

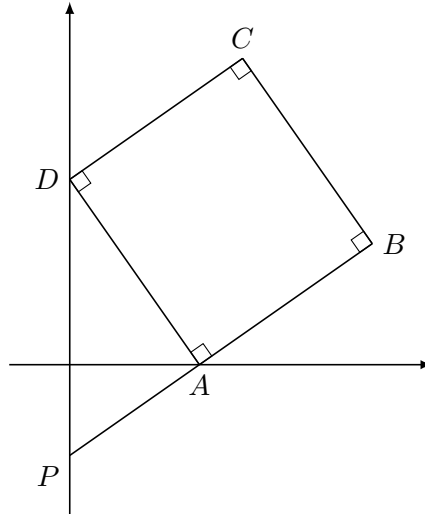
(a) The y-axis:

(b) The x-axis:

6. A and B are straight lines. Line A has equation  $2y = 3x + 8$ . Line B goes through the points  $(-1, 2)$  and  $(2, 8)$ . Do lines A and B intersect? You must show all your working.

**(3)**

7.

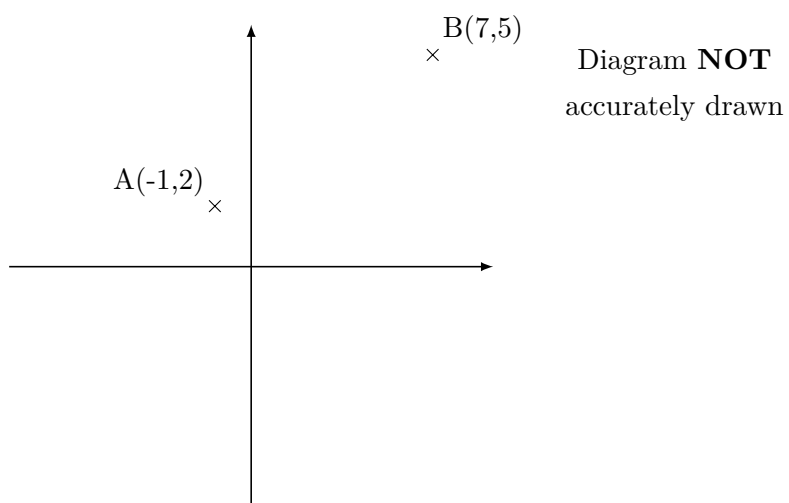


$ABCD$  is a square.  $P$  and  $D$  are points on the  $y$ -axis.  $A$  is a point on the  $x$ -axis.  $PAB$  is a straight line.

The equation of the line that passes through the points  $A$  and  $D$  is  $y = -2x + 6$ . Find the length of  $PD$ .

**(4)**

8.



$A$  is the point  $(-1, 2)$ .  $B$  is the point  $(7, 5)$ .

(a) Find the coordinates of the midpoint of  $AB$ . (2)

(.....,.....)

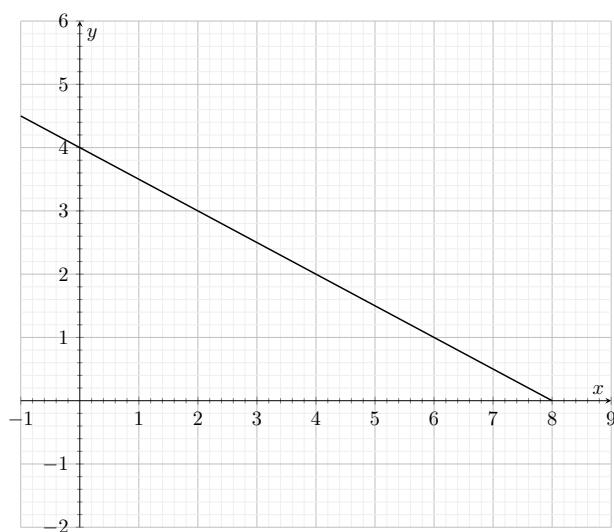
$P$  is the point  $(-4, 4)$

$Q$  is the point  $(1, -5)$

(b) Find the gradient of  $PQ$ . (2)

(.....,.....)

9.



The graph of the straight line  $x + 2y = 8$  is shown on the grid.

(a) On the grid, draw the graph of  $y = x/2 - 1$ . (3)

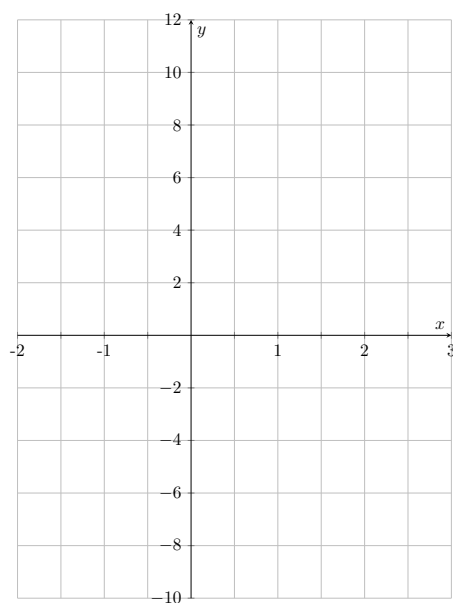
(b) Use the graphs to find estimates for the solution of (1)

$$x + 2y = 8$$

$$y = \frac{x}{2} - 1$$

x = -----, y = -----

10. On the grid, draw the graph of  $y = 4x - 2$



- (a) Find the gradient of the straight line with equation  $2x - 3y = 12$ . (2)

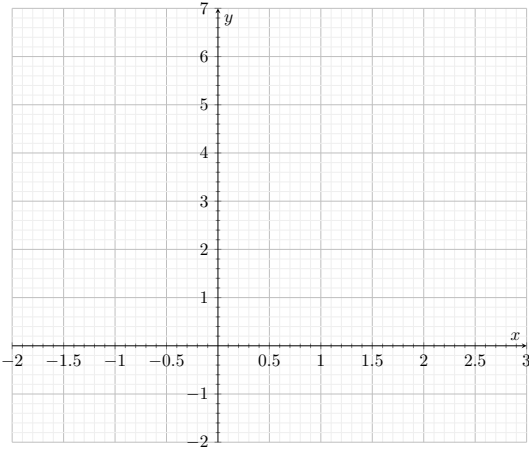
- (b) Prove that the straight line with equation  $2y = 10 - 3x$  is perpendicular to the straight line with equation  $2x - 3y = 12$ . (2)



11. (a) Complete the table of values for  $3x + 2y = 6$ . (2)

x	-2	-1	0	1	2	3
y		4.5	3			-1.5

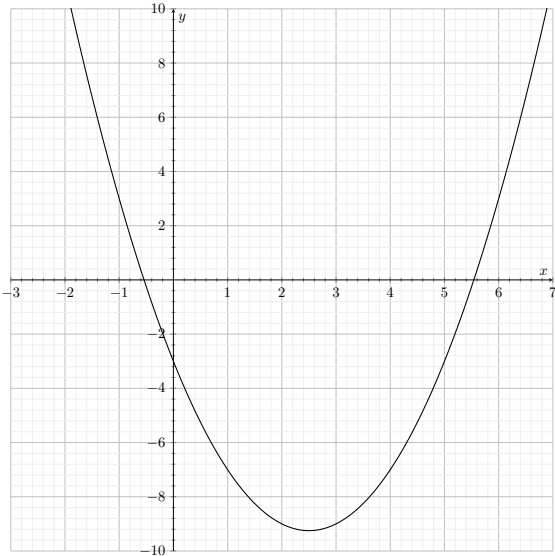
- (b) On the grid, draw the graph of  $3x + 2y = 6$ . (2)



- (c) Find the gradient of the graph of  $3x + 2y = 6$ . (2).

-----

12. The diagram shows the graph of  $y = x^2 - 5x - 3$



(a) Use the graph to find estimates for the solutions of (3)

i.  $x^2 - 5x - 3 = 0$

-----

ii.  $x^2 - 5x - 3 = 6$

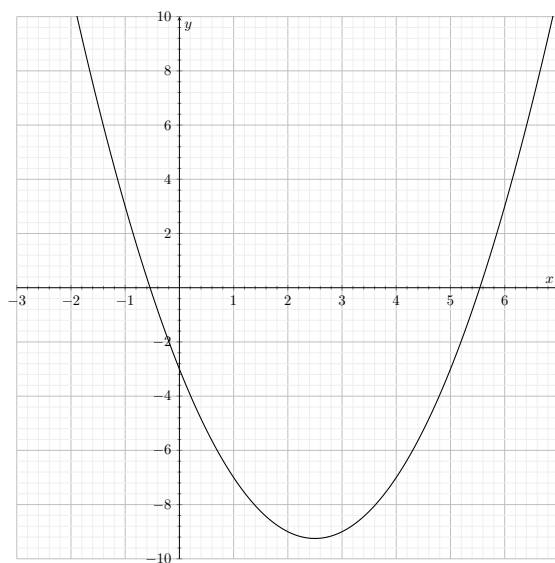
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(b) Use the graph to find estimates for the solutions of the simultaneous equations (3)

$$y = x^2 - 5x - 3$$

$$y = x - 4$$

-----



13.

(a) Use the graph to find estimates for the solutions of (3)

i.  $x^2 - 5x - 3 = 0$

-----

ii.  $x^2 - 5x - 3 = 6$

-----

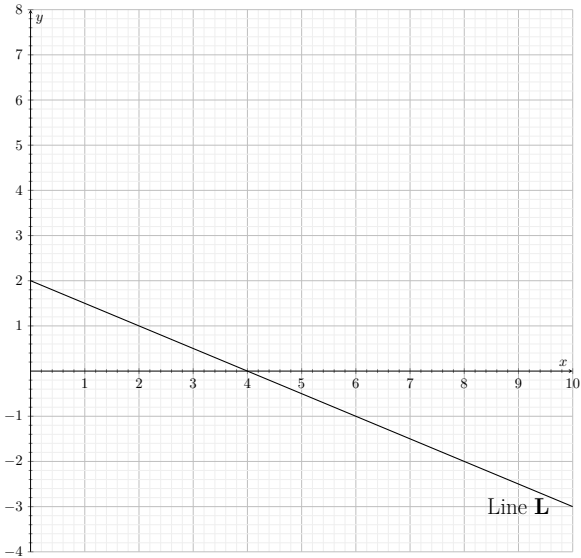
(b) Use the graph to find estimates for the solutions of the simultaneous equations (3)

$$y = x^2 - 5x - 3$$

$$y = x - 4$$

-----

14.



Line **L** is drawn on the grid.

- (a) Work out the gradient of Line **L**. (2)

-----

Another line, Line **M**, is parallel to Line **L** and passes through the point  $(6, 2)$ .

- (b) Find an equation for Line **M**. (2)

-----

15. A straight line passes through  $(0, -2)$  and  $(3, 10)$ . Find the equation of the straight line.

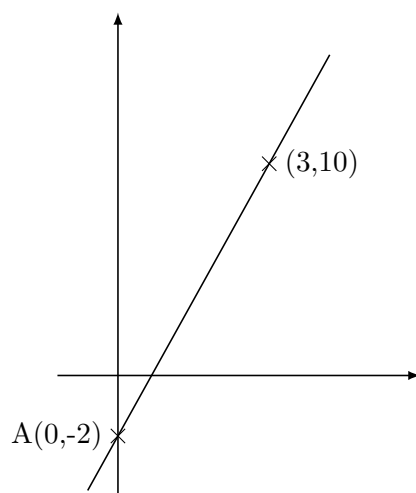
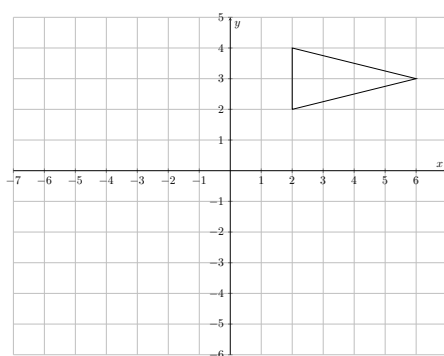


Diagram **NOT**  
accurately drawn

## Chapter 11

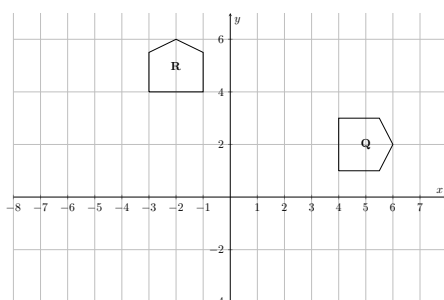
# GCSE Transformation Questions

1.



On the grid, enlarge the triangle by scale factor  $-\frac{1}{2}$ , centre  $(0, -2)$ . (2)

2.



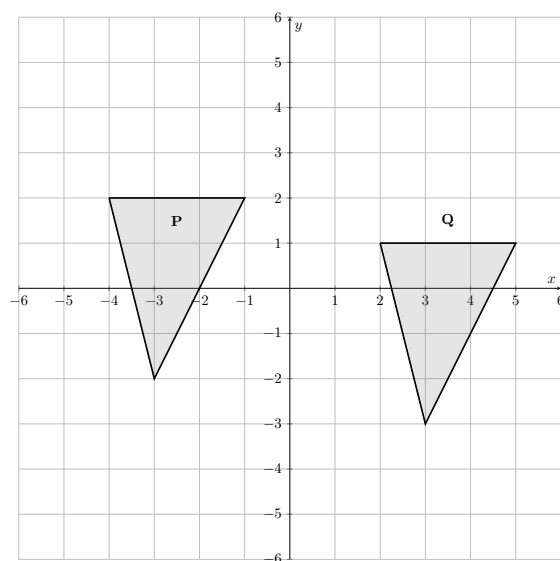
Describe fully the single transformation that maps shape **Q** onto shape **R**. (3)

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-----

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3.

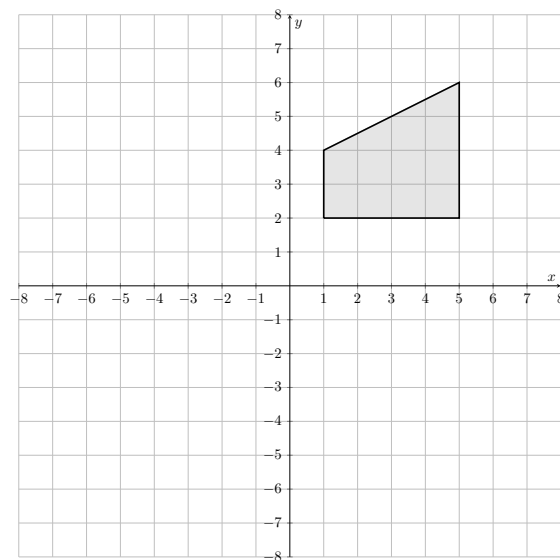


Describe fully the single transformation that maps triangle **P** onto triangle **Q**. (2)

-----

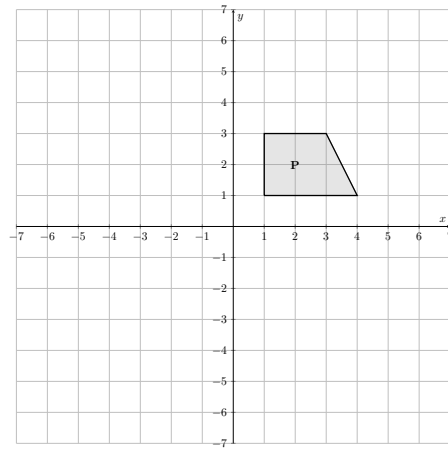
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4.



Enlarge the shaded shape by scale factor  $-\frac{1}{2}$  with centre  $(-1, -2)$ . (3)

5.



Shape  $P$  is reflected in the line  $x = -1$  to give shape  $Q$ .

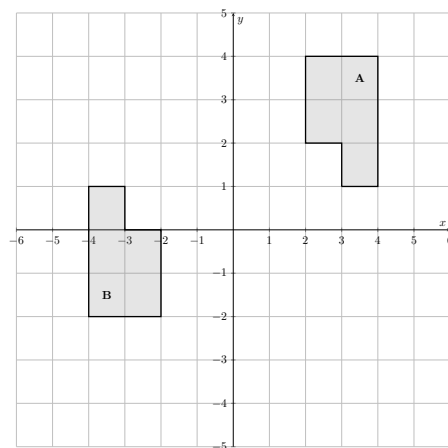
Shape  $Q$  is reflected in the line  $y = 0$  to give shape  $R$ .

Describe fully the single transformation that maps shape  $P$  onto shape  $R$ . (3)

-----

-----

6.

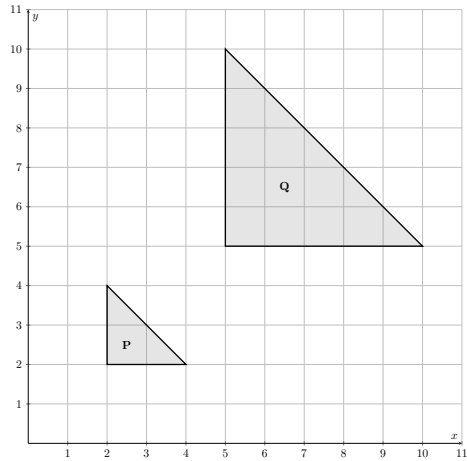


Describe fully the single transformation that maps shape **A** onto shape **B** (3)

-----

-----

7.

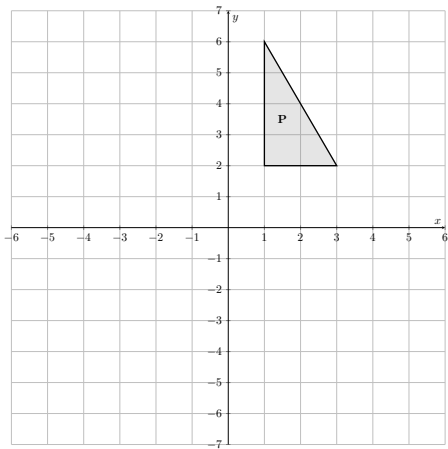


Describe fully the single transformation that maps shape **P** onto shape **Q**. (3)

-----

-----

8.



Triangle **P** is drawn on a coordinate grid. The triangle **P** is reflected in the line  $x = -1$  and then reflected in the line  $y = 1$  to give triangle **Q**.

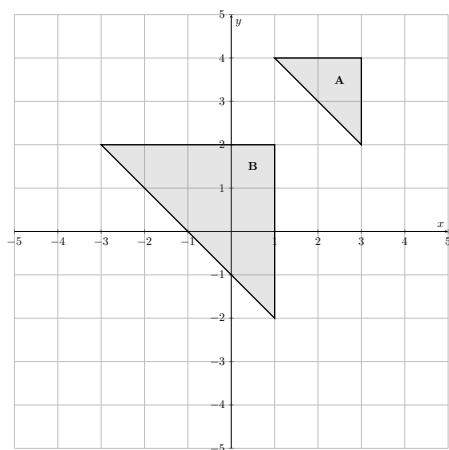
Describe fully the single transformation which maps triangle **P** onto triangle **Q**. (3)

-----

-----

9.



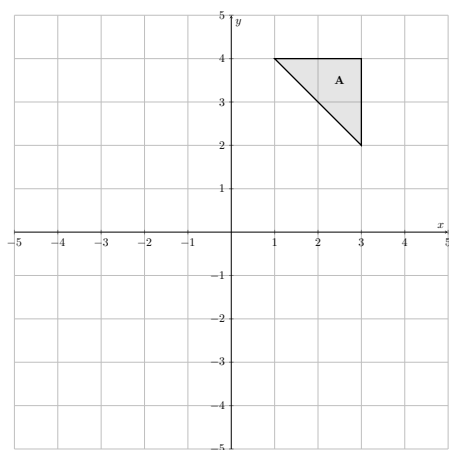


Triangle **A** and triangle **B** are drawn on the grid.

- (a) Describe fully the single transformation which maps triangle **A** onto triangle **B**. **(3)**

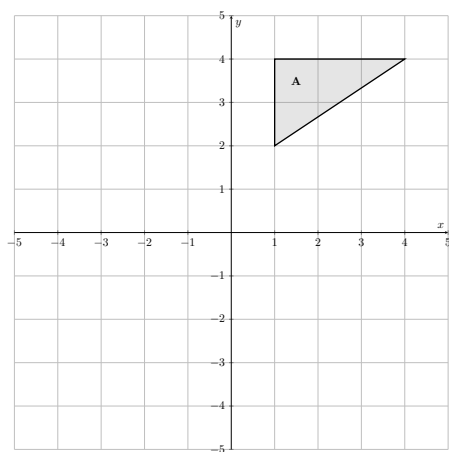
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 -----

(b)



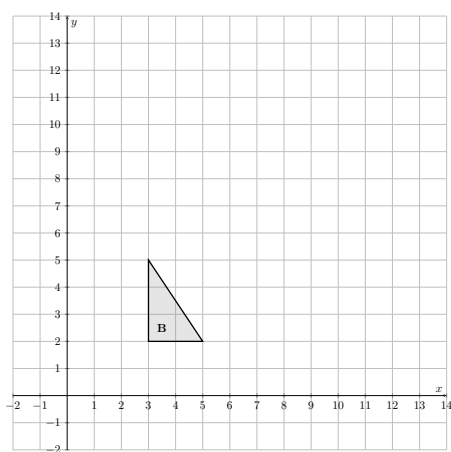
Reflect triangle **A** in the line  $x = 4$ . **(2)**

10. (a)



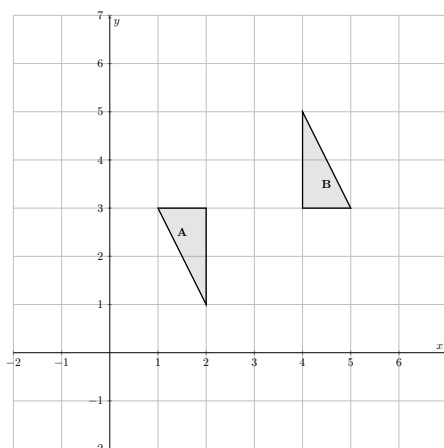
Rotate triangle *A*  $90^\circ$  clockwise, centre *O*.

(b)



Enlarge triangle **B** by scale factor 3, centre (1, 2).

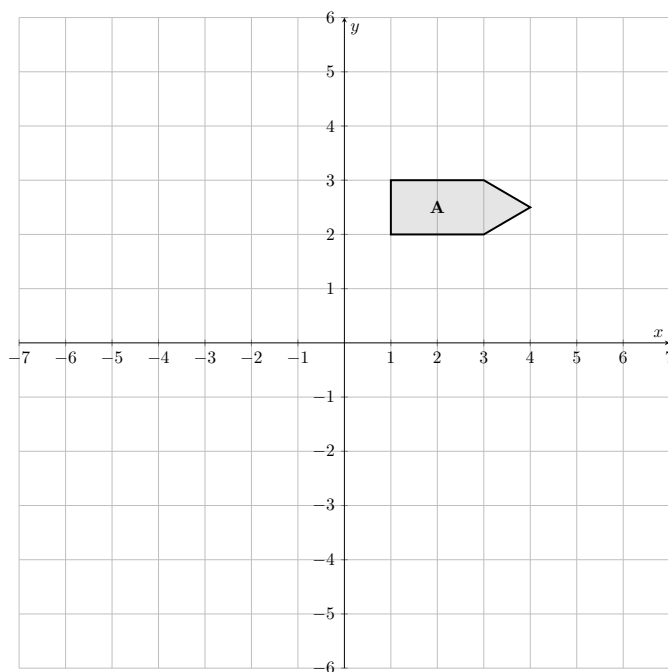
11.



Describe fully the single transformation that maps triangle **A** onto triangle **B**. (3)

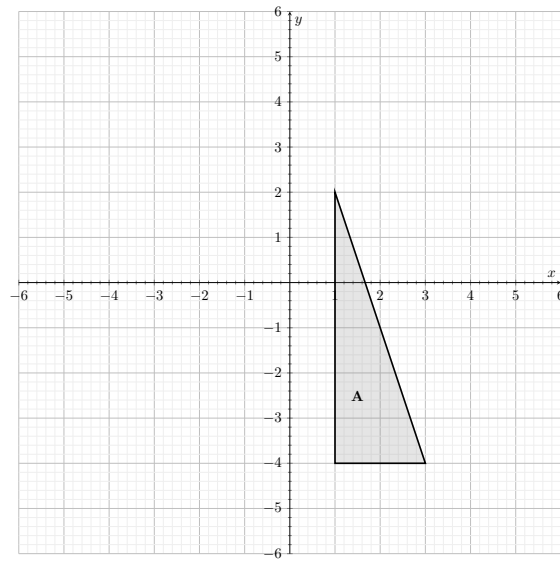
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12. (a)



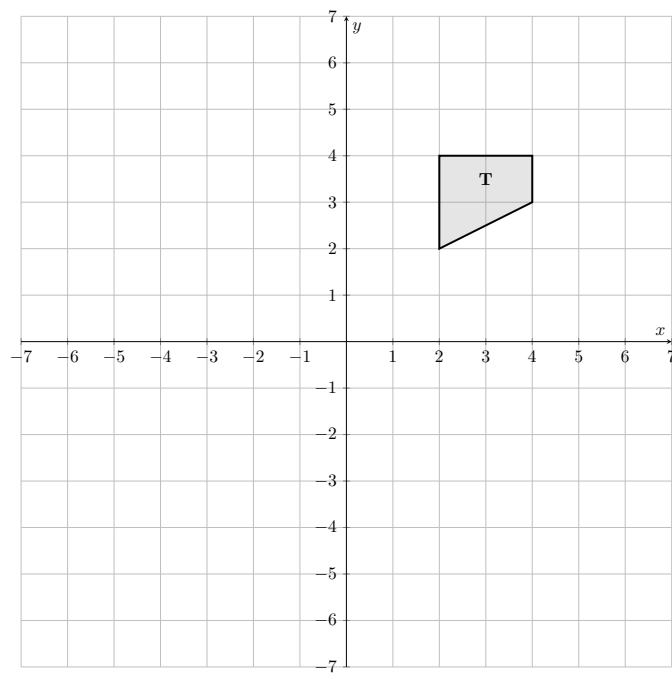
On the grid above, reflect shape **A** in the line  $x = 1$ . (2)

(b)



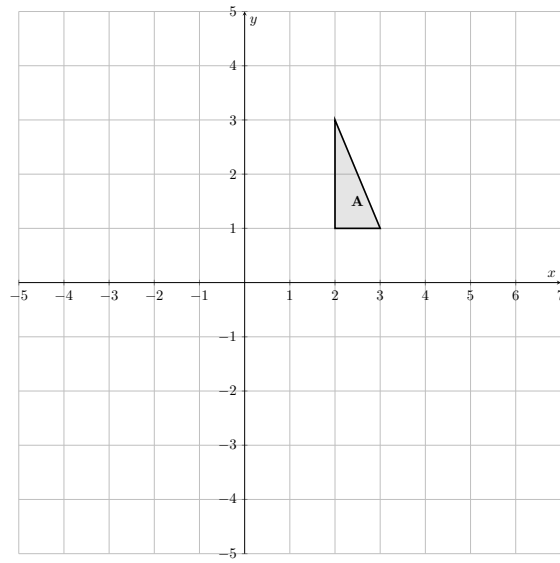
Enlarge triangle **A** by scale factor  $-\frac{1}{2}$ , centre  $(-1, -2)$ . Label your triangle **B**. (2)

13.



Enlarge shape **T** with scale factor  $-1.5$ , centre  $(0, 2)$ . (3)

14.



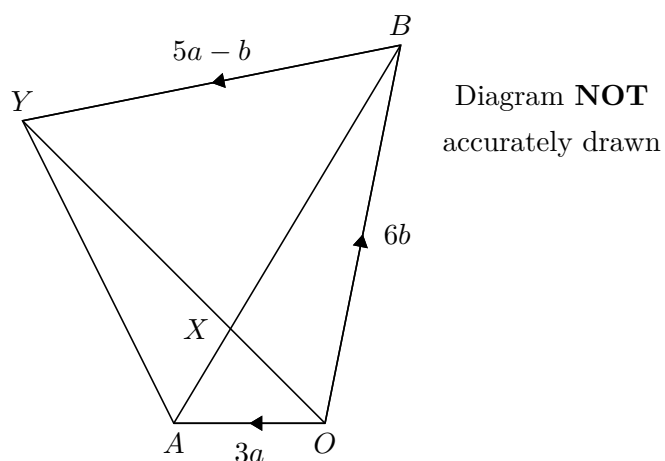
Enlarge triangle **A** by scale factor  $-1\frac{1}{2}$ , centre  $O$ . (3)



## Chapter 12

# GCSE Revision Questions - Vectors

1.



OAYB is a quadrilateral.  $\overrightarrow{OA} = 3\mathbf{a}$  and  $\overrightarrow{OB} = 6\mathbf{b}$ .

(a) Express  $\overrightarrow{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (1)

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$X$  is the point on  $AB$  such that  $AX : XB = 1 : 2$  and  $\overrightarrow{BY} = 5\mathbf{a} - \mathbf{b}$ .

(b) Prove that  $\overrightarrow{OX} = \frac{2}{5}\overrightarrow{OY}$ . (1)

2.

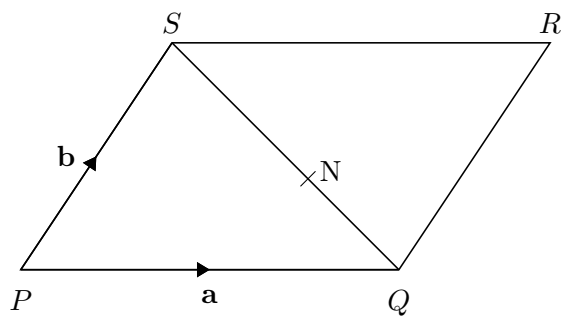


Diagram **NOT**  
accurately drawn

PQRS is a parallelogram.  $N$  is the point on  $SQ$  such that  $SN : NQ = 3 : 2$

$$\overrightarrow{PQ} = \mathbf{a}$$

$$\overrightarrow{PS} = \mathbf{b}$$

(a) Write down, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , an expression for  $\overrightarrow{SQ}$ . (1)

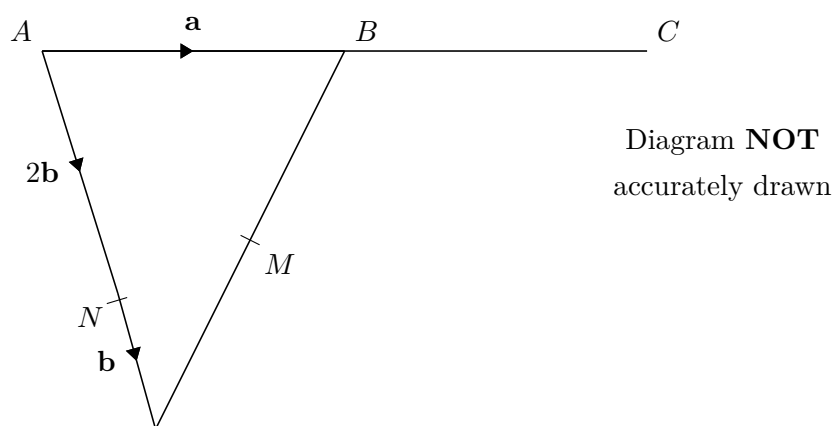
$\overrightarrow{SQ}$ .....

(b) Express  $\overrightarrow{NR}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (3)

$\overrightarrow{NR}$ .....



3.



$APB$  is a triangle.  $N$  is a point on  $AP$ .

$$\overrightarrow{AB} = \mathbf{a} \quad \overrightarrow{AN} = 2\mathbf{b} \quad \overrightarrow{NP} = \mathbf{b}$$

- (a) Find the vector  $\overrightarrow{PB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (1)

- (b)  $B$  is the midpoint of  $AC$ .  $M$  is the midpoint of  $PB$ . Show that  $NMC$  is a straight line. (4)

4.

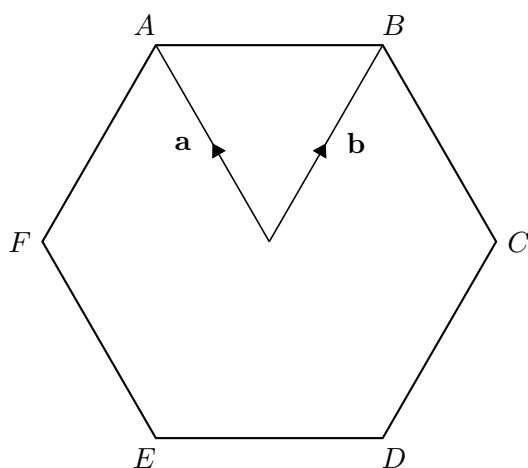


Diagram **NOT**  
accurately drawn

$ABCDEF$  is a regular hexagon, with centre  $O$ .

$\overrightarrow{OA} = \mathbf{a}$ ,  $\overrightarrow{OB} = \mathbf{b}$ .

(a) Write the vector  $\overrightarrow{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (1)

-----

(b) The line  $AB$  is extended to the point  $K$  so that  $AB : BK = 1 : 2$ . Write the vector  $\overrightarrow{CK}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . Give your answer in its simplest form.. (3)

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5.

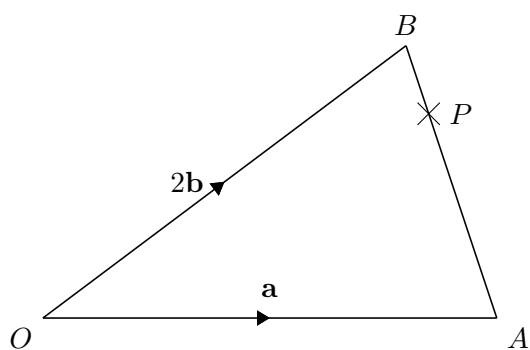


Diagram **NOT**  
accurately drawn

$OAB$  is a triangle.  $\overrightarrow{OA} = \mathbf{a}$ ,  $\overrightarrow{OB} = \mathbf{b}$ .

- (a) Find  $\overrightarrow{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (1)

-----

- (b)  $P$  is the point on  $AB$  such that  $AP : PB = 3 : 1$ . Find  $\overrightarrow{OP}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .  
Give your answer in its simplest form. (3)

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6.

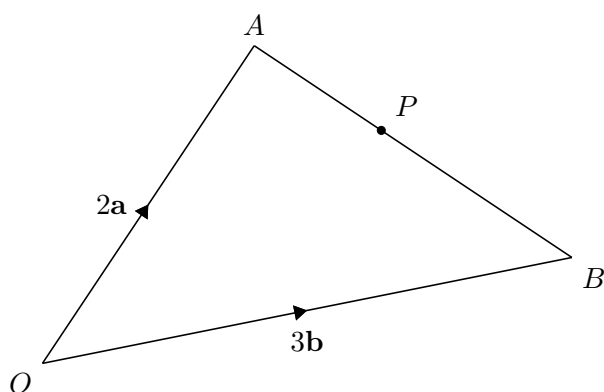


Diagram **NOT**  
accurately drawn

$OAB$  is a triangle.  $\overrightarrow{OA} = 2\mathbf{a}$ ,  $\overrightarrow{OB} = 3\mathbf{b}$ .

(a) Find  $AB$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (1)

$\overrightarrow{AB} = \dots\dots\dots$

(b)  $P$  is the point on  $AB$  such that  $AP : PB = 2 : 3$ . Show that  $\overrightarrow{OP}$  is parallel to the vector  $\mathbf{a} + \mathbf{b}$ . (3)

7.

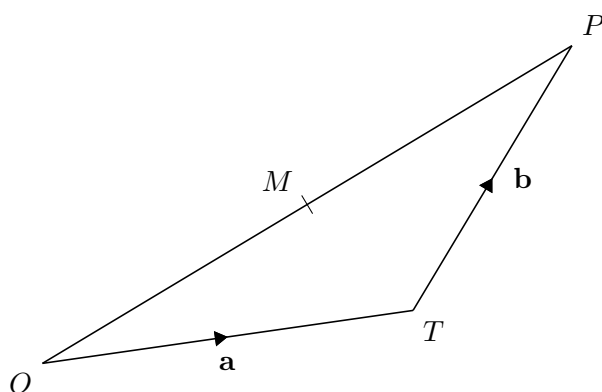


Diagram **NOT**  
accurately drawn

$OPT$  is a triangle.  $M$  is the midpoint of  $OP$ .

$\overrightarrow{OT} = \mathbf{a}$ ,  $\overrightarrow{TP} = \mathbf{b}$ .

(a) Express  $\overrightarrow{OM}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (2)

$\overrightarrow{OM} = \dots\dots\dots$

(b) Express  $\overrightarrow{TM}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . Give your answer in its simplest form. (2)

$\overrightarrow{OM} = \dots\dots\dots$

8.

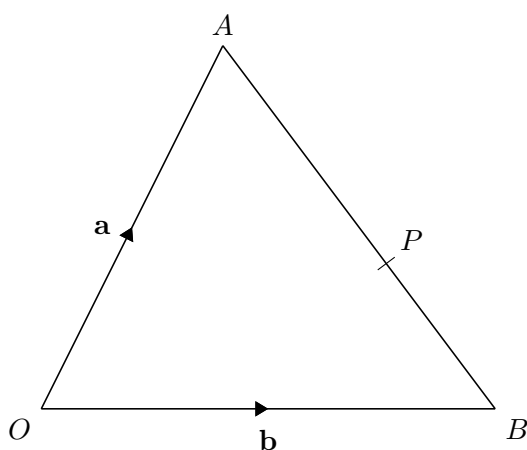


Diagram **NOT**  
accurately drawn

$OAB$  is a triangle.  $\overrightarrow{OA} = \mathbf{a}$ ,  $\overrightarrow{OB} = \mathbf{b}$ .

(a) Find the vector  $\overrightarrow{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ . (1)

$\overrightarrow{AB} = \dots\dots\dots$

(b)  $P$  is the point on  $AB$  such that  $AP : PB = 3 : 2$ . Show that  $\overrightarrow{OP} = \frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$ . **(3)**