Year 11 (HIGHER)

GCSE Maths

Revision Pack

~~Assessment Week~~

~~December 2023~~

September → December
(TERM 1).

Name________________ **Form**_____

Number Sequences (ALL)

Linear

-3 +3 +3 +3

2 5, 8, 11, 14, …

Di=3
N=n
O=2

$3n + 2$

Geometric

$1, 2, 4, 8, 16, \ldots$

x2 x2 x2 x2 x2

$64, 16, 4, 1, \frac{1}{4}, \frac{1}{16}$

÷4 ÷4 ÷4 ÷4 ÷4

Multiply or divide by the same number

Quadratic

5 14 29 50 77

9 15 21 27

6 6 6

$2a = 6$

$a = 3$

$3a + b = 9$
$3(3) + b = 9$
$3 + b = 9$
$b = 0$

$a + b + c = 5$
$3 + 0 + c = 5$
$c = 2$

Sequence is $3n^2+2$

Fibonacci

RULE: Fibonacci sequence: the next term in the sequence is the sum of the two previous terms.

2 3 5 8 13 21 34

2 + 3 | 3 + 5 | 5 + 8 | 8 + 13 | 13 + 21

Find the first 6 terms of the Fibonacci sequence:

$x_n = x_{n-1} + x_{n-2}$

$a, b, a + b$

The 4th term: $b + a + b = a + 2b$

The 5th term: $a + b + a + 2b = 2a + 3b$

The 6th term: $a + 2b + 2a + 3b = 3a + 5b$

$a, b, a + b, a + 2b, 2a + 3b, 3a + 5b$

Questions – Find the nth term of these sequences

9, 14, 19, 24, … …	13, 22, 31, 40, … …
10, 7, 4, 1, … …	-10, -13, -16, -19, … …
2, 5, 10, 17, 26 … …	3, 14, 29, 48, 71 … …

2) Continue the following geometric sequences:

a) 1, 2, 4, 8, ……. , ……..

b) 5, 50, 500, 5000, …………… , …………………

c) 3, 9, 27, 81, ……… , ………

d) 4, 20, 100, ………… , …………

e) 4, 16, 64, ……… , ………

f) 64, 32, 16, 8, 4, ……… , …………

Find the next three terms of the following Fibonacci-style sequences

(a) 2, 4, 6, 10, …

(b) 3, 6, 9, 15, …

(c) 4, 8, 12, 20, …

(d) 15, 23, 38, 61, …

(e) 5, 12, 17, 29, …

(f) −3, 5, 2, 7, …

For each of the following Fibonacci-style sequences, find the next 4 terms.

(a) $a, 4a, 5a, 9a, \ldots$

(b) $3x, 3x+y, 6x+y, 9x+2y, \ldots$

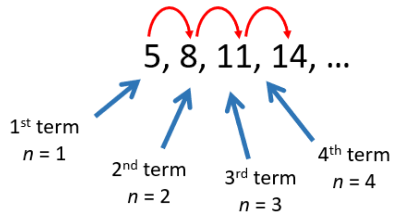
(c) $6a, -2a, 4a, 2a, \ldots$

(d) $2y, y+z, 3y+z, \ldots$

(e) $4x-5y, 2x-y, 6x-6y, \ldots$

(f) $-x, x+y, y, \ldots$

Examples– generating sequences



3n +5

hen n = 1, 3(1)+5 =8
hen n = 2, 3(2)+5 =11
hen n = 3, 3(3)+5 =14
hen n = 4, 3(4)+5 =17
hen n = 5, 3(5)+5 =20

Sequence:
8,11,14,17,20

$2n^2 - 3$

When n = 1, $2(1^2) - 3 = -1$
When n = 1, $2(2^2) - 3 = 5$
When n = 1, $2(3^2) - 3 = 15$
When n = 1, $2(4^2) - 3 = 29$
When n = 1, $2(5^2) - 3 = 47$

Sequence: -1,5,15,29,47

Questions – generating sequences

The n^{th} term for some sequences are given below.
Find the first 5 terms for each sequence.

(a)	$5n + 3$	(b)	$2n + 9$	(c)	$3n - 2$
(d)	$10n - 6$	(e)	$9n + 10$	(f)	$n + 8$
(g)	$-7n + 20$	(h)	$50 - 5n$	(i)	$3.5n + 4$

For each n^{th} term, work out the first five terms of the sequence.

(a) $n^2 + n$ (b) $n^2 + 2n$ (c) $n^2 - n$ (d) $n^2 - 3n$

(e) $n^2 + n + 2$ (f) $n^2 - 2n + 5$ (g) $n^2 + 4n - 10$ (h) $2n^2 + n$

(i) $3n^2 - n + 6$ (j) $10n^2 + 5n - 7$

Yr 11 (H) Revision - Iteration.

<u>Example ①</u> Solve $x^3 - 8x - 10 = 0$ to 3dp

<u>Step 1</u> Make the "x" with the largest power, the subject

ie. $x = \sqrt[3]{10 + 8x}$

<u>Step 2</u> Given that $x_0 = 3$, solve.

Substitute $x = 3$ into $\sqrt[3]{10 + 8x}$

$x_0 = 3$ gives $3.239611\ldots$

Now sub. $x = 3.239611$ into etc...

$x_0 = 3$ $x_1 = 3.239611$

$x_2 = 3.29938$

$x_3 = 3.31396$

$x_4 = 3.31749$ & keep going until

$x_5 = 3.\underline{\underline{318}}35$ $x_6 = 3.\underline{\underline{318}}46$

1) Use the iteration $x_{n+1} = \sqrt{\dfrac{2x_n + 4}{5}}$

to work out an approximate solution to $x = \sqrt{\dfrac{2x+4}{5}}$

Start with $x_1 = 1$

Give your answer to 2 decimal places.

2) $x_{n+1} = \sqrt[3]{3x_n + 7}$

Use a starting value of $x_1 = 2$ to work out a solution to $x = \sqrt[3]{3x+7}$

Give your answer to 3 decimal places.

3) Show that the equation $x^3 + 8x = 30$ has a solution between $x = 2.2$ and $x = 2.3$

Yr 11 (H) Revision - Functions.

Example(s)

① $f(x) = 3x+2$, work out/solve.

$f(7) = 3(7)+2 = 23$.
$f(-5) = 3(-5)+2 = -13$
$f(2x+1) = 3(2x+1)+2$
$= 6x+3+2 = 6x+5$.

Solve $f(x) = 29$. ie- $3x+2 = 29$
$3x = 27$
$x = \frac{27}{3} = \underline{\underline{9}}$

② Composite Functions.

$f(x) = 4x+2$ | $g(x) = x^2-3$.

a) $fg(x)$ Put $g(x)$ into f.

sub. $\underbrace{x^2-3}$ into $4x+2$

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

$= 4x^2-12+2$

$= \underline{\underline{4x^2-10}}$

b) $gf(x)$ Put $f(x)$ into g

sub. $\underbrace{4x+2}$ into x^2-3

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

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

$= \underline{\underline{16x^2+16x+1}}$

1a) For all values of x, $f(x) = 2x^2 + 3$ $g(x) = x + 4$

(a) Show that $fg(x) = 2x^2 + 16x + 35$

1b) (b) Solve $fg(x) = gf(x)$

2) $f(x) = 3^x$ and $g(x) = 3x + 7$

(a) Work out the value of $f(2) + g(5)$

3) $f(x) = 2x^2$

$g(x) = x + 5$

Work out the composite function $fg(x)$

Yr 11 (H) Revision – Inverse Functions.

Example(s)

① $f(x) = 2x - 3$, Expression for $f^{-1}(x)$

↳ $y = 2x - 3$. [make x the subject].

$$\frac{y+3}{2} = x \Rightarrow f^{-1}(x) = \frac{x+3}{2}$$

② $f(x) = 5x^2 + 4$ Expression for $f^{-1}(x)$.

↳ $y = 5x^2 + 4$ [make x the subject].

$$\sqrt[2]{\frac{y-4}{5}} = x \Rightarrow f^{-1}(x) = \sqrt[2]{\frac{x-4}{5}}$$

③ $g(x) = 3x^2 - 2$ Work out $f^{-1}(46)$.

$y = 3x^2 - 2$ making "x" the subject

gives $x = \sqrt{\frac{y+2}{3}}$ $f^{-1}(x) = \sqrt{\frac{x+2}{3}}$

$$\therefore f^{-1}(46) = \sqrt{\frac{46+2}{3}} = \sqrt{16} = \underline{4}$$

1) $f(x) = \frac{3x+9}{5}$ Show that $f^{-1}(8)$ is **not** an integer.

2) $f(x) = 2x + 5$

Show that $3f(x) - 12f^{-1}(x)$ simplifies to an integer.

3) For all values of x, $f(x) = \frac{9x+4}{7}$

Work out $f^{-1}(x)$

Yr 11 (H) – Triple Brackets & Identities.

Example(s)

① Expand & Simplify $\underbrace{(x+3)(x-5)}(x+4)$

$(x+3)(x-5) = x^2+2x-15.$

$(x^2+2x-15)(x+4)$

$= x^3+4x^2+2x^2+8x-15x-60$

$= x^3+6x^2-7x-60$

② Equating Coefficients...

$\underbrace{3(ax+1)}-\underbrace{(6x+b)} \equiv 21x-8$

$3ax+3-6x-b \equiv 21x-8$

$3ax-6x = 21x$	$3-b = -8$
$3a-6 = 21$	$-b = -11$
$3a = 27$	$b = 11$
$a = 9$	

1) Show that $(3x + 4)(2x - 5) - 11x(x - 2) + 5(x^2 - 3x - 1)$ simplifies to an integer.

2) Expand and simplify fully $(x - 3)(x - 4)(x + 8)$

3) $(5x + 2)(x - 3) + ax + b \equiv 5x^2 - 16x + 7$

Work out the values of a and b

Yr 11 (H) Revision – Factorising Quads.

Example ① Factorise & Solve

$x^2 + 3x - 28 = 0$. Find a pair of N°'s which multiply to make -28 & sum to 3.

~~1, 28~~
~~2, 14~~
$-4, 7$

$(x-4)(x+7) = 0$

$\underline{\underline{x = 4}}$ $\quad$ $\underline{\underline{x = -7}}$

Example ② Factorise & Solve

$9x^2 - 64$. This is known as

"the difference of two squares".

$\sqrt{9x^2} = 3x$ & $\sqrt{64} = 8$

$\therefore \; 9x^2 - 64 = \underline{(3x-8)(3x+8)}$.

Example ③ Factorise

$$3x^2 \underbrace{- 7x}_{} + 4$$

(ac) 12 ~~1, 12~~
(b) -7 ~~2, 6~~
$-3, -4$

$$3x^2 - 3x - 4x + 4$$

$$3x(x-1) - 4(x-1)$$

$$\underline{(3x-4)(x-1)}$$

1) (a) Factorise $5x^2 + 6x - 8$

(b) Simplify fully $\dfrac{x^2+9x+14}{x^2-4}$

2) Factorise fully $2x^2 - 50y^2$

3) Simplify $\dfrac{3x^2-19x+20}{x^2-25}$

Yr 11 (H) Revision - Completing the Square

Example 1 Write $x^2 - 6x + 5$ in the form $(x+a)^2 + b$

step i) ½ of $-6 = \underline{\underline{-3}}$

step ii) $(-3)^2 = 9$ .... but must always be (−)ve $= \underline{\underline{-9}}$

$$x^2 - 6x + 5 = (x-3)^2 - 9 + 5$$

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

$a = -3$
$b = -4$

Example 2 Locate the turning / minimum point for $y = x^2 + 8x - 3$.

step i) ½ of $+8 = +4$.

step ii) $(+4)^2 = 16 \Rightarrow$ must be -16.

$$x^2 + 8x - 3 = (x+4)^2 - 16 - 3$$

$$= (x+4)^2 - 19$$

Turning point is at $\underline{\underline{(-4, -19)}}$.

1) Write $x^2 + 10x + 28$ in the form $(x + a)^2 + b$

2) The equation of a curve is $y = (x + 3)^2 + 5$

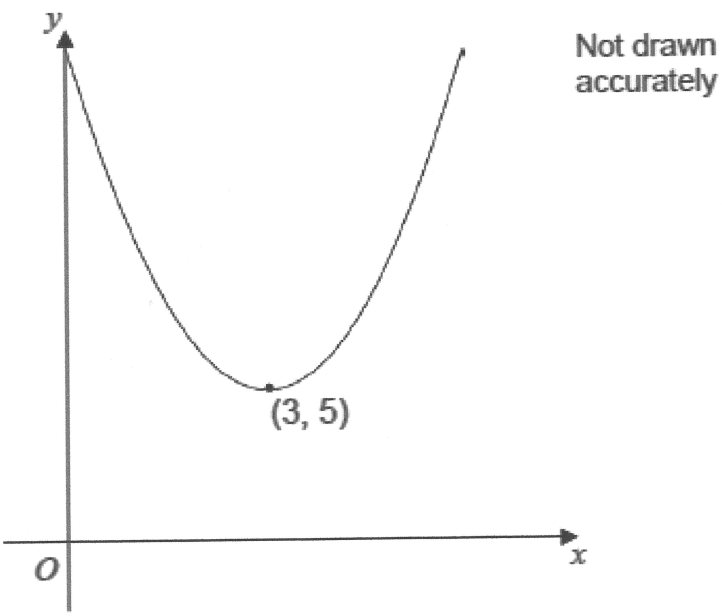
Circle the coordinates of the turning point.

(5, 3) (5, −3) (3, 5) (−3, 5)

3) Write $x^2 - 10x + 29$ in the form $(x - a)^2 + b$

4) A sketch of $y = x^2 + cx + d$ is shown.

The turning point is (3, 5)



Work out the values of c and d.

Yr 11 (H) Revision - Quad Formula

You will need to memorise this formula:

For any quadratic, of the form

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

<u>Example ①</u> Use the quad formula to solve $5x^2 + x - 3 = 0$ to 2 dp.

Here: $\left.\begin{array}{l} a = 5 \\ b = 1 \\ c = -3 \end{array}\right\} \quad x = \dfrac{-1 \pm \sqrt{(1)^2 - (4)(5)(-3)}}{(2)(5)}$

Typing this into a calculator very carefully,

Using the (+) $\quad x = 0.68$

Using the (−) $\quad x = -0.88$

1) Using the quadratic formula, or otherwise, solve $3x^2 + x - 5 = 0$

2) Solve $4x^2 + 7x - 3 = 0$

Give your answers to 2 decimal places.

3) Solve $\frac{5}{4x+1} = \frac{2x}{x^2+3}$

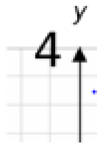
Give your solutions to 3 significant figures.

To enlarge a shape or describe an enlargement you need these two details:

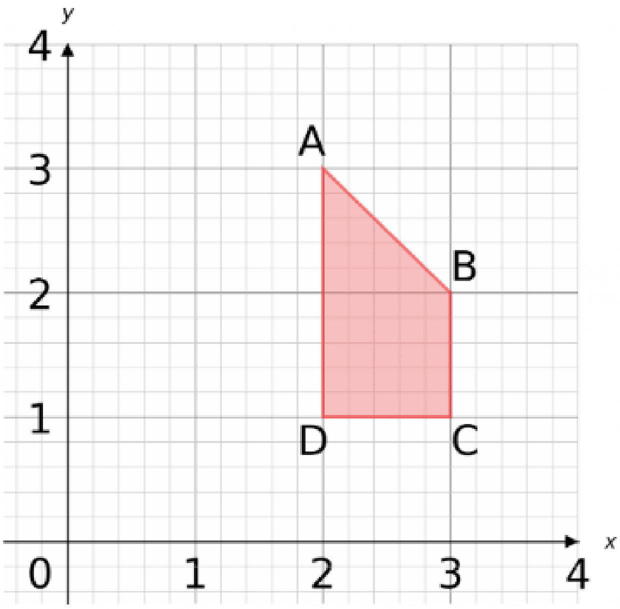
- The **Scale factor** $\left(\text{Scale factor} = \dfrac{\text{New Length}}{\text{Old Length}}\right)$
- The **centre of enlargement** (co-ordinates)

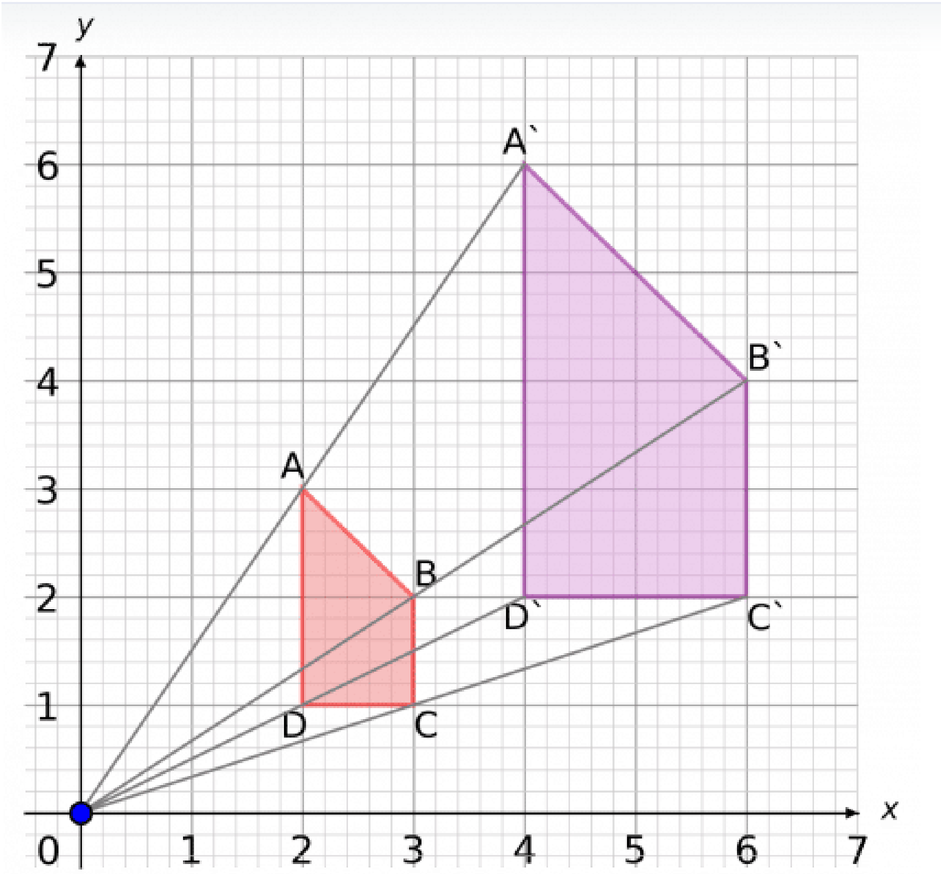
Example: Enlarge shape $ABCD$ below by scale factor 2 about the origin.

The **centre of enlargement** is the origin $(0,0)$

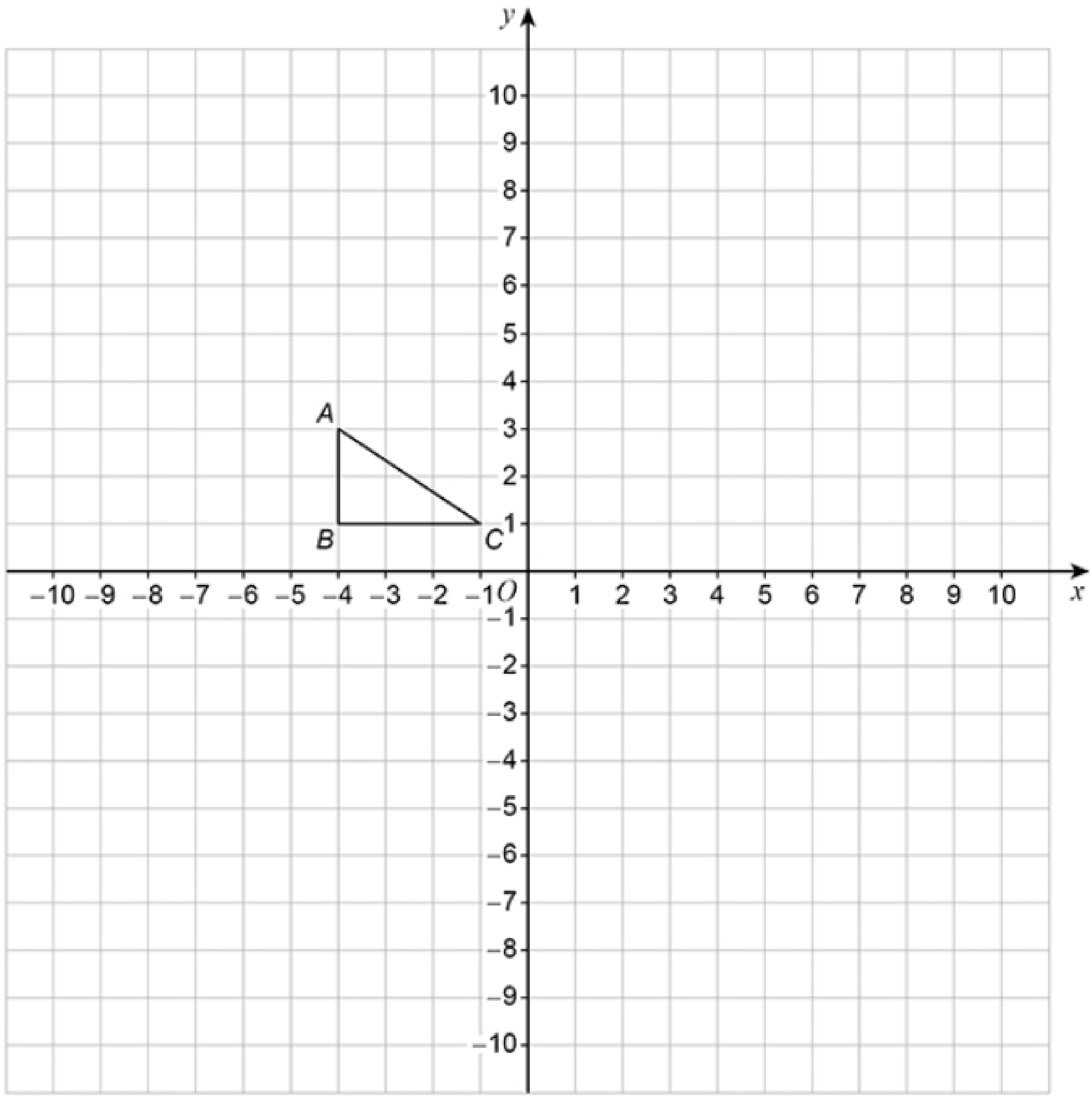


The **Scale factor** is 2





1)



ABC is transformed to *A'B'C'* by a reflection in the line $x = 1$

A'B'C' is transformed to *A''B''C''* by a rotation 90° anticlockwise about (1, –4)

Which **one** point on *ABC* is invariant under the combined transformation?

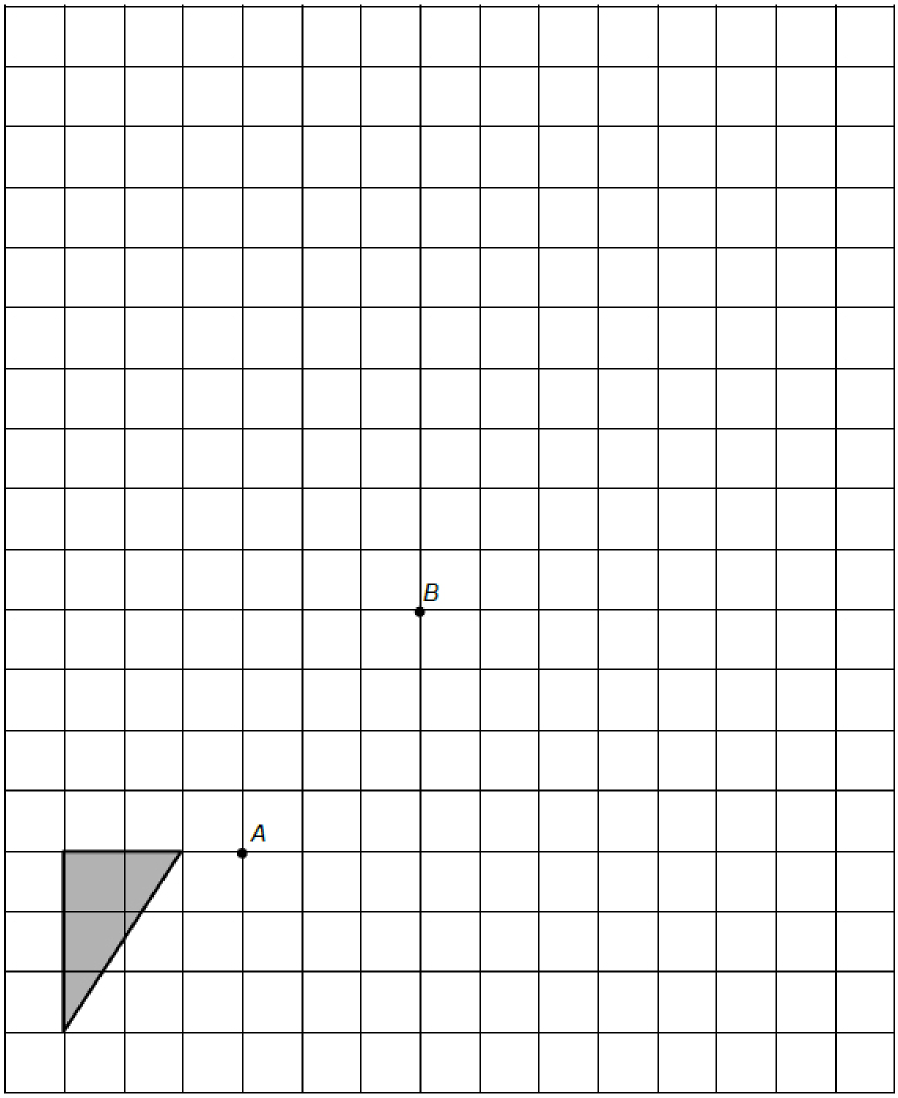
You **must** show the result of each transformation on the grid.

Answer ______________________________

2) The shape is **rotated** 180° about point *A*.

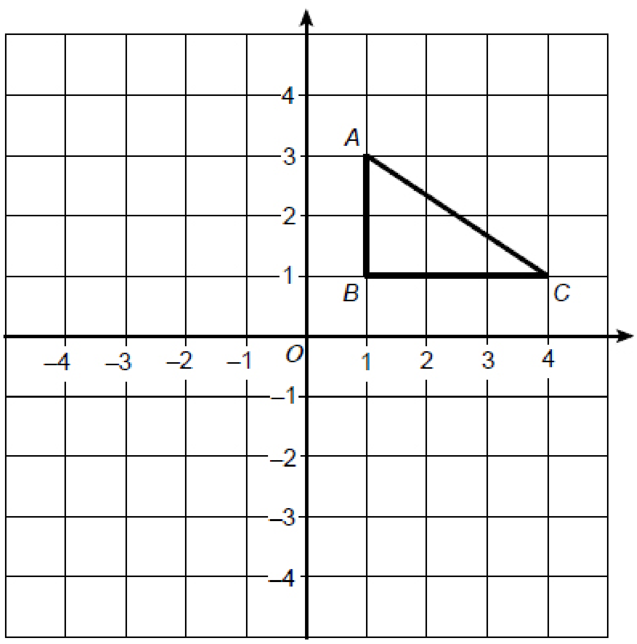
It is then **enlarged** by scale factor −2, centre *B*.

Draw the final shape on the diagram.



2)

(a) Here is triangle *ABC*.

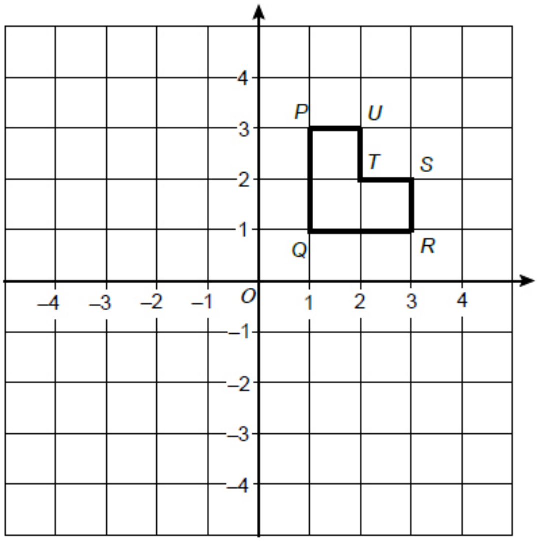


Describe fully a **single** transformation of the triangle for which

all points on *AB* are invariant

there are no other invariant points.

3) Here is an L-shape *PQRSTU*.



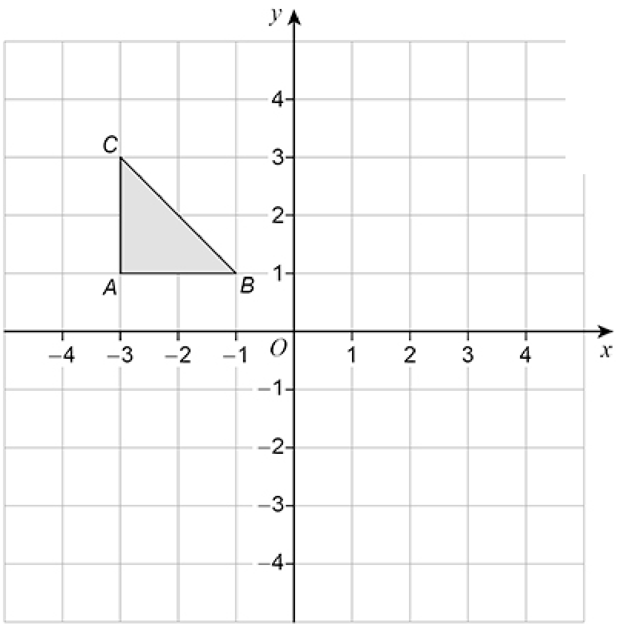
Describe fully a **single** transformation of the L-shape for which

Q is invariant

the line joining *P* and *Q* becomes horizontal

the area of the L-shape does not change.

4) Here is triangle *ABC* on a grid.



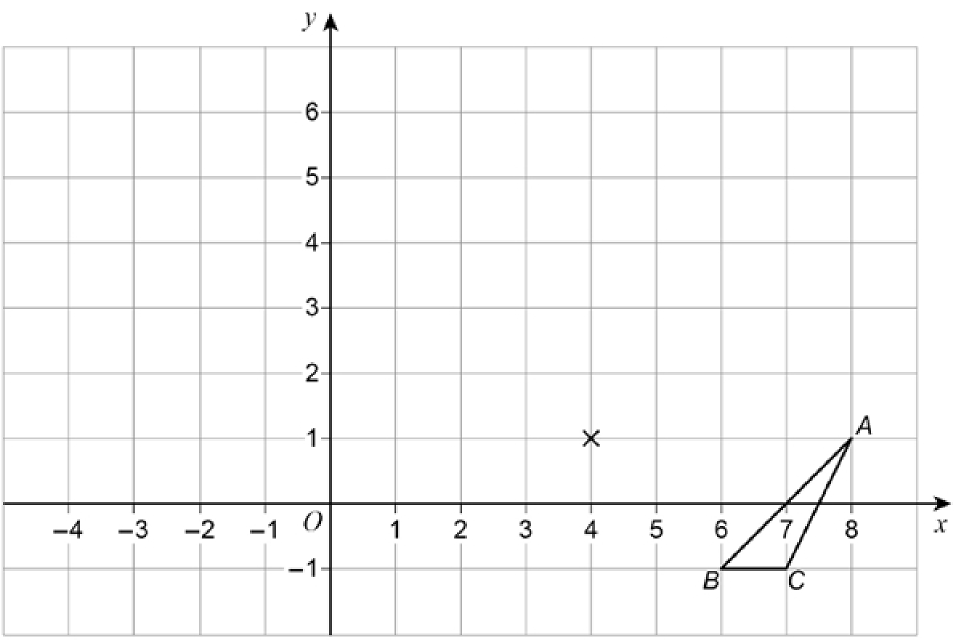
Describe a **single** transformation of the triangle so that

point *B* is invariant

point *A* moves to (1, 1)

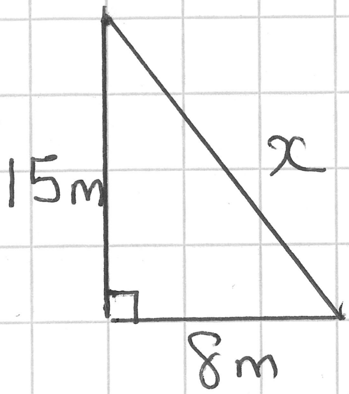
point *C* moves to (1, –1)

5) Enlarge triangle *ABC* by scale factor –2, centre (4, 1)



Yr 11 (H) Revision – SOH CAH TOA.

Example ①

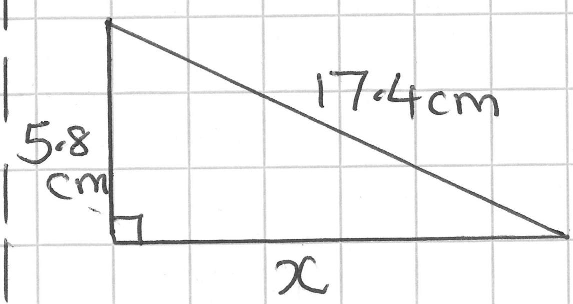


$$x^2 = 15^2 + 8^2$$

$$x^2 = 289$$

$$x = \sqrt{289} = \underline{17}$$

Example ②

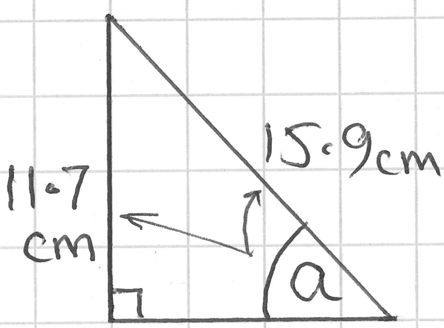


$$x^2 = 17.4^2 - 5.8^2$$

$$x^2 = 269.12\ldots$$

$$x = \underline{\underline{16.4}}$$

Example ③



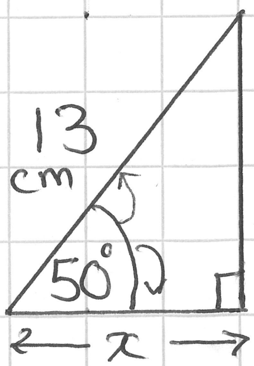
SOH

CAH

TOA

$$\sin^{-1}\left(\frac{opp}{hyp}\right) \Rightarrow \sin^{-1}\left(\frac{11.7}{15.9}\right) = \underline{\underline{47.4^\circ}}$$

Example ④



SOH

CAH

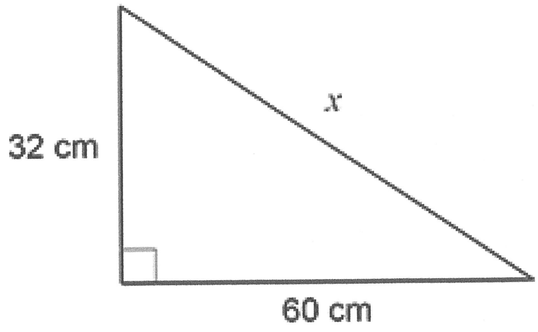
TOA

$$\cos(50) = \frac{x}{13}$$

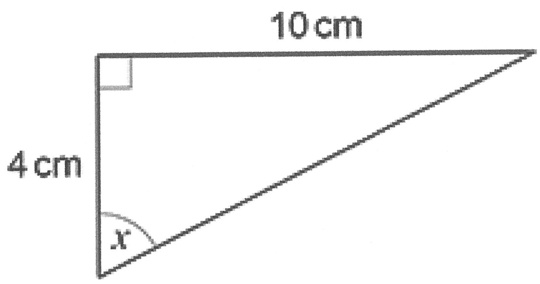
$$13 \times \cos(50) = x$$

$$x = \underline{\underline{8.36\text{cm}}}$$

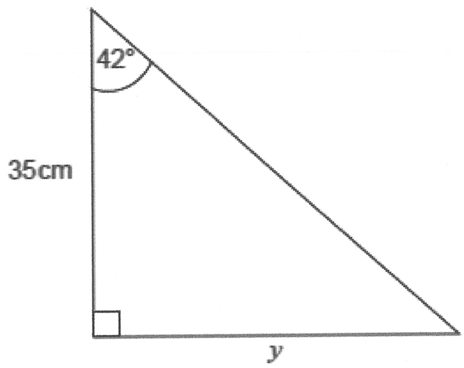
1)



2)

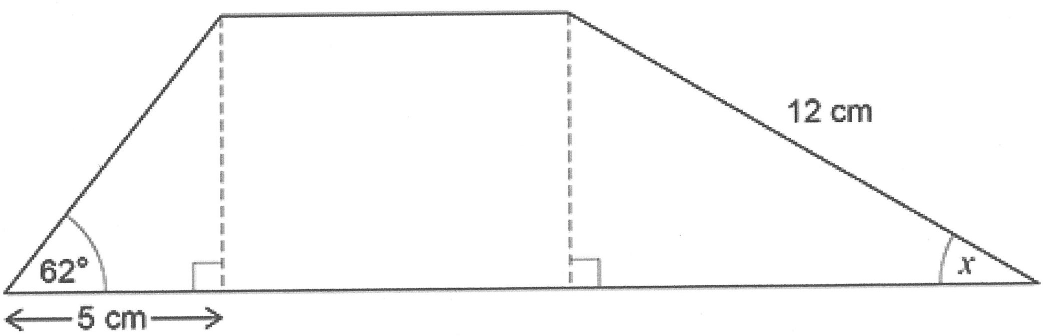


3)



Not drawn accurately

4)



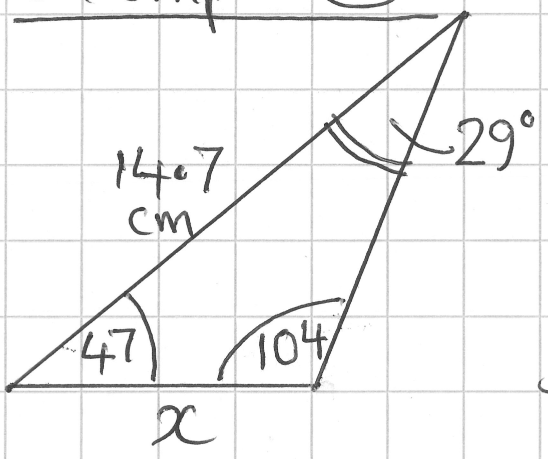
Work out the size of angle x.

Yr 11 (H) Revision - Sine Rule

To calculate a length $\quad \dfrac{a}{\sin(A)} = \dfrac{b}{\sin(B)}$

To calculate an angle $\quad \dfrac{\sin(A)}{a} = \dfrac{\sin(B)}{b}$.

Example (1)

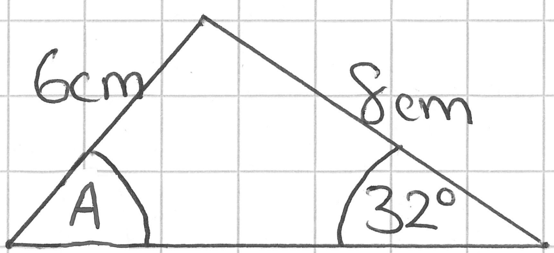


firstly work out the missing angle.... $180 - 47 - 104 = \underline{\underline{29}}$

$$\frac{x}{\sin(29)} = \frac{14{\cdot}7}{\sin(104)}$$

$$x = \frac{14{\cdot}7}{\sin(104)} \times \sin(29) = \underline{\underline{7{\cdot}34\text{cm}}}$$

Example (2)

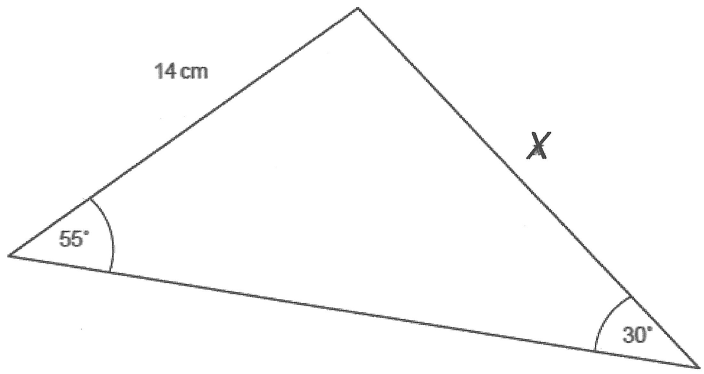


$$\frac{\sin(A)}{8} = \frac{\sin(32)}{6}$$

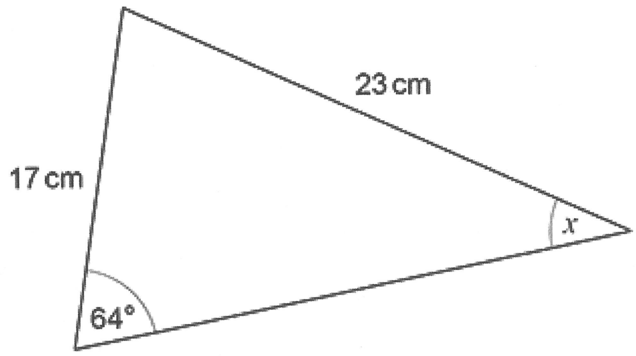
$$\sin(A) = \frac{\sin(32)}{6} \times 8.$$

then $\sin^{-1}(\text{ANS}) = \underline{\underline{45°}}$

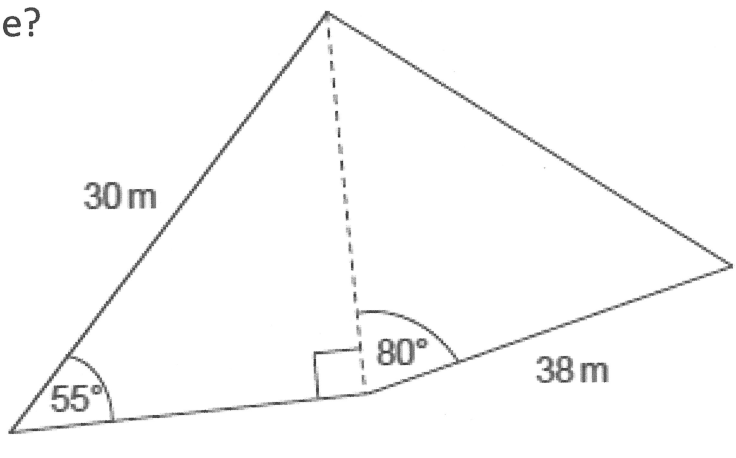
1)



2)



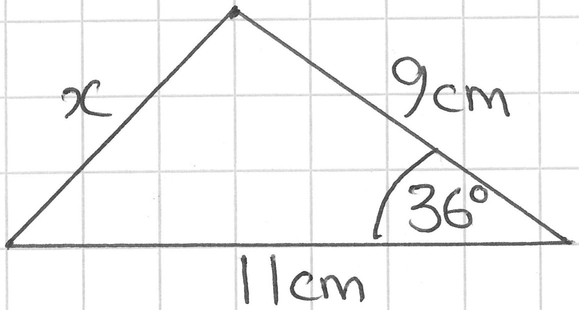
3) Perimeter of shape?



Yr 11 (H) Revision – Cosine Rule.

$$a^2 = b^2 + c^2 - 2bc.\cos(A).$$

Example ①



$$x^2 = 9^2 + 11^2 - 2 \times 9 \times 11 \times \cos(36)$$

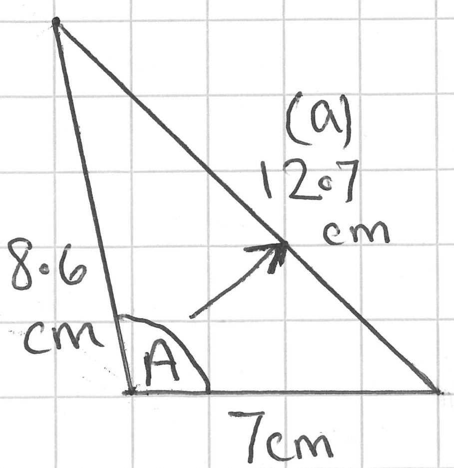
$$x^2 = 41.8146\ldots,$$

$$(\sqrt{\ }) \quad x = \underline{\underline{6.47\text{cm}}}$$

Example ②

Given all three sides, work out any angle... Firstly, rearrange the cosine rule to

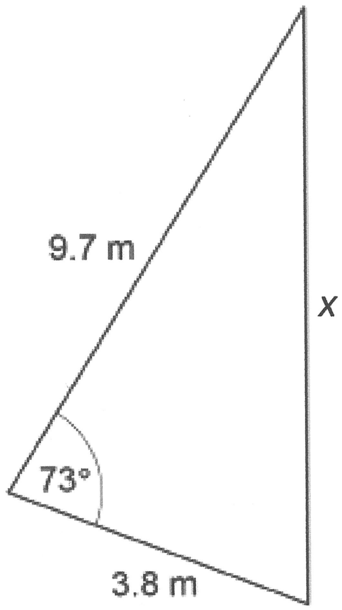
$$\cos(A) = \frac{a^2 - b^2 - c^2}{-2bc.}$$



$$\cos(A) = \frac{12.7^2 - 8.6^2 - 7^2}{(-2)(8.6)(7)}$$

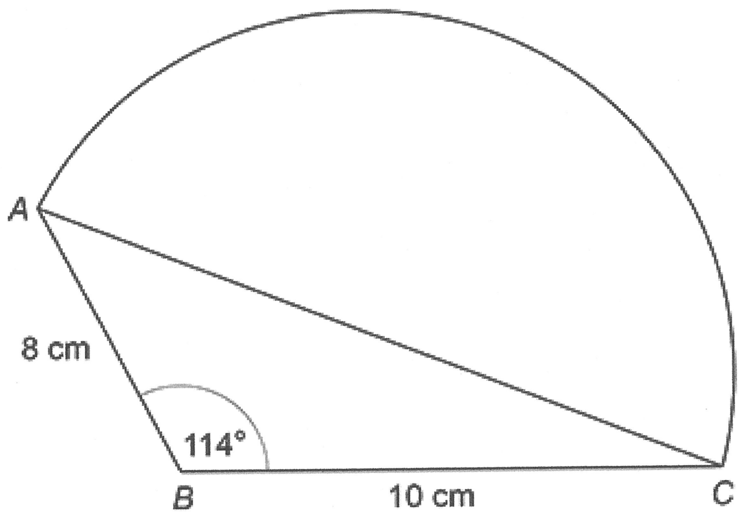
then $\cos^{-1}(\text{ANS}) = \underline{\underline{109.6^\circ}}$

1) Work out length x

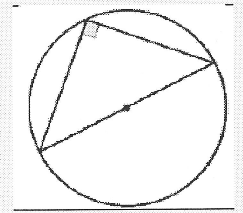
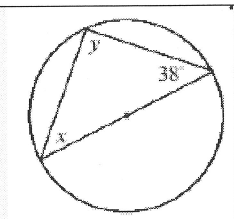
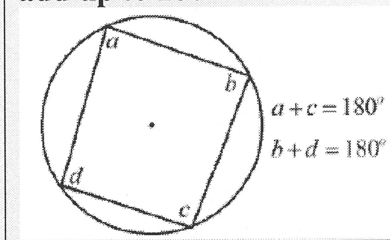
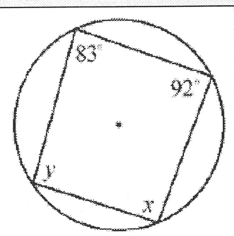
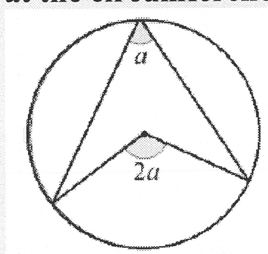
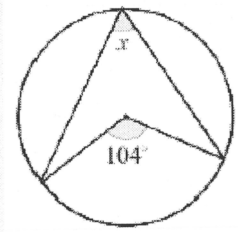
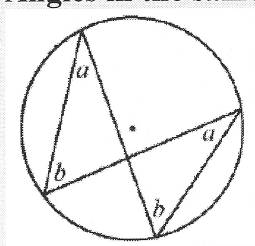
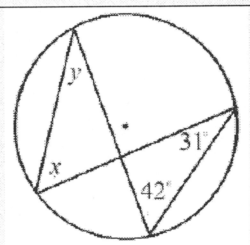
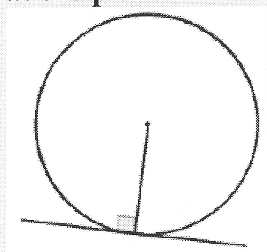
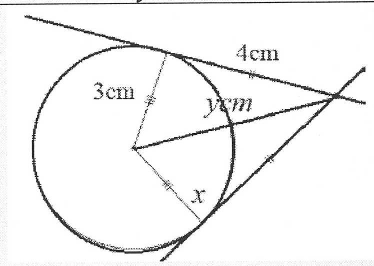


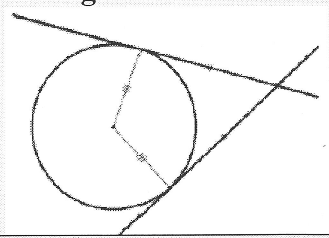
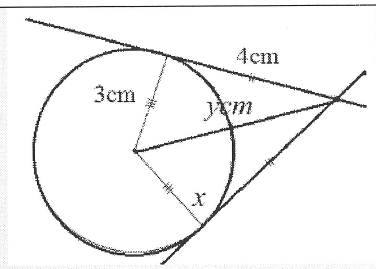
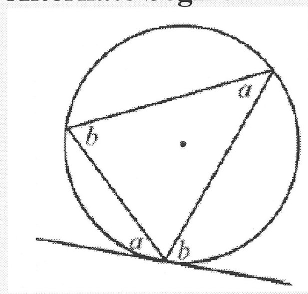
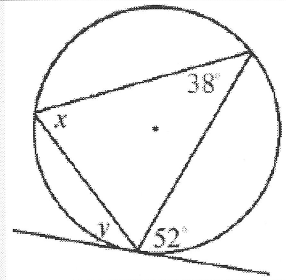
2) A shape is made by joining triangle *ABC* to a semicircle with diameter *AC*.

Not drawn accurately



Work out the **total** area of the shape.

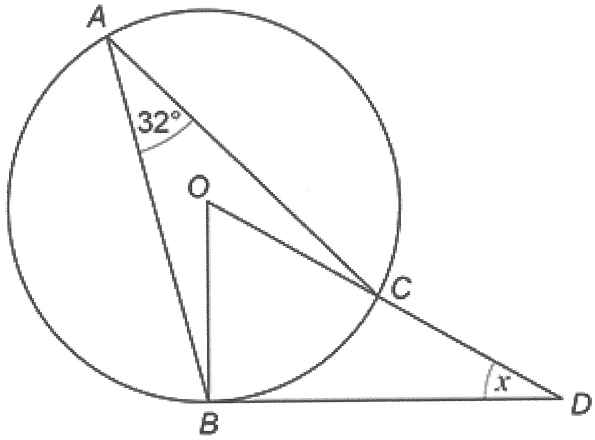
Topic/Skill	Definition/Tips	Example
Circle Theorem 1	**Angles in a semi-circle have a right angle at the circumference.** 	 $y = 90°$ $x = 180 - 90 - 38 = 52°$
Circle Theorem 2	**Opposite angles in a cyclic quadrilateral add up to 180°.**  	 $x = 180 - 83 = 97°$ $y = 180 - 92 = 88°$
Circle Theorem 3	**The angle at the centre is twice the angle at the circumference.**  	 $x = 104 \div 2 = 52°$
Circle Theorem 4	**Angles in the same segment are equal.**  	 $x = 42°$ $y = 31°$
Circle Theorem 5	**A tangent is perpendicular to the radius at the point of contact.** 	 $y = 5cm$ (Pythagoras' Theorem)

Circle Theorem 6	**Tangents from an external point at equal in length.** 	 $x = 90°$
Circle Theorem 7	**Alternate Segment Theorem** 	 $x = 52°$ $y = 38°$

1) A, B and C are points on a circle, centre O.

BD is a tangent to the circle.

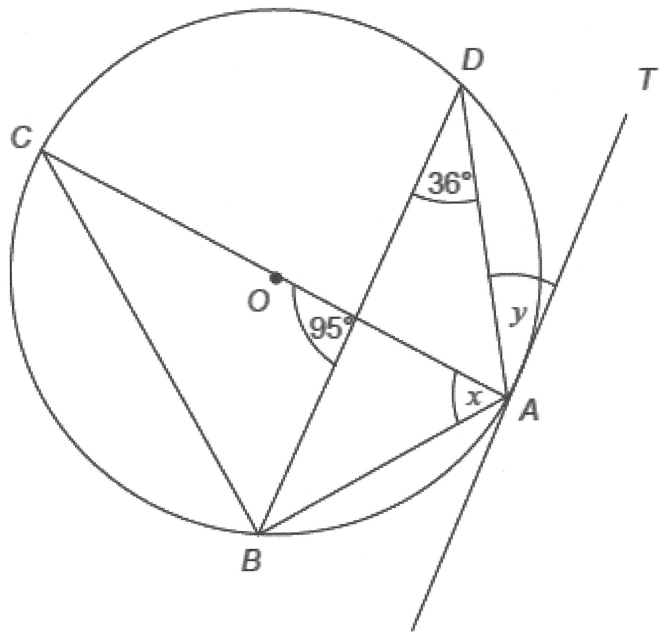
OCD is a straight line.



Work out the size of angle x.

2) A, B, C and D are points on a circle, centre O.

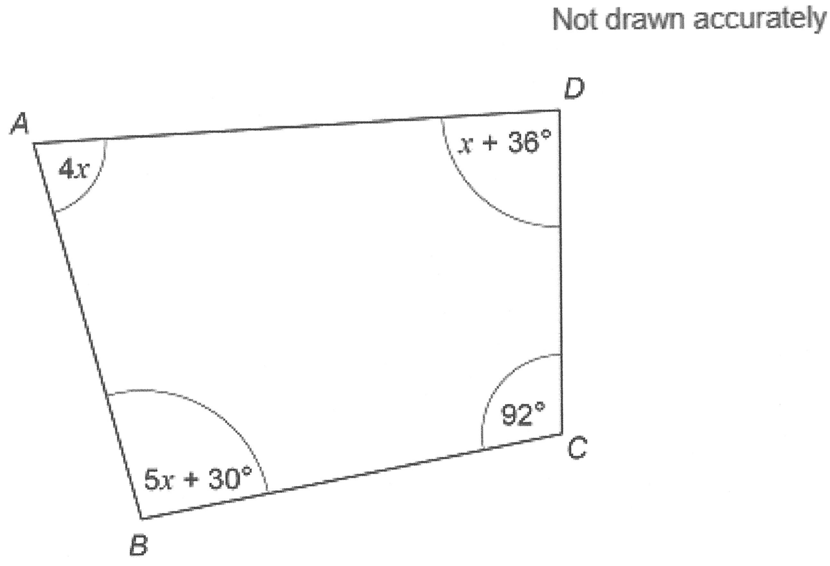
AC is a diameter of the circle.



AT is a tangent to the circle.

Work out the size of angle x and the size of angle y

3) *ABCD* is a quadrilateral.

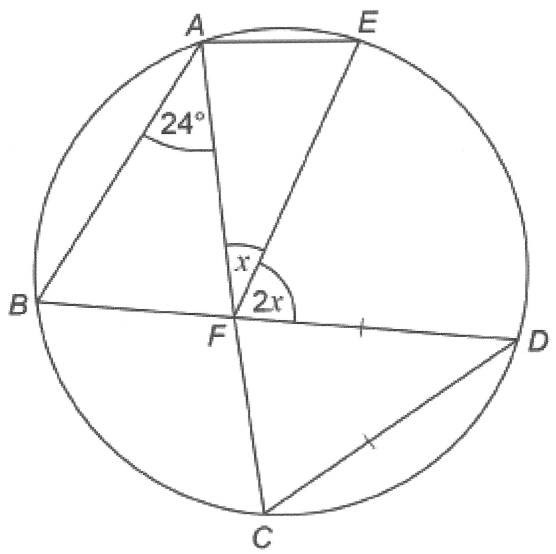


Prove that *ABCD* is **not** a cyclic quadrilateral.

4) *A*, *B*, *C*, *D* and *E* are points on a circle.

BFD and *AFC* are straight lines.

$DC = DF$



Not drawn accurately

Work out the size of angle x.

You **must** show your working which may be on the diagram.

Yr 11 (H) Revision – Parallel / Perpendicular lines.

Example 1 Straight line goes through the points (2,1) & (8,19). Eq^n of line?

step i) $m = \frac{\Delta y}{\Delta x} = \frac{19-1}{8-2} = \frac{18}{6} = \underline{\underline{3}}$

step ii) $\left.\begin{array}{l} y = 19 \\ m = 3 \\ x = 8 \end{array}\right\}$ $y = mx + c$

$19 = 24 + c$

$\underline{\underline{c = -5}}$

$y = \underline{\underline{3x - 5}}$

Example 2 Line (A) goes through point (3, 17) & is parallel to $y = 5x - 4$. Eq^n of line (A)?

$\left.\begin{array}{l} y = 17 \\ m = 5 \\ x = 3 \end{array}\right\}$ $y = mx + c$

$17 = 15 + c$

$\underline{\underline{c = 2}}$

$y = \underline{\underline{5x + 2}}$

Example 3 Line (A) goes through point (8, 1) & is perpendicular to $y = 4x + 7$. Eq^n of (A)?

$\left.\begin{array}{l} y = 1 \\ m = -\frac{1}{4} \\ x = 8 \end{array}\right\}$ $y = mx + c$

$1 = \left(-\frac{1}{4}\right)(8) + c$

$1 = -2 + c$

$\underline{\underline{c = 3}}$

$y = \underline{\underline{\frac{-1}{4}x + 3}}$

1) Work out the equation of the line that

is parallel to the line $y = 4x - 1$ and passes through $(-1, 1)$

2) A straight line

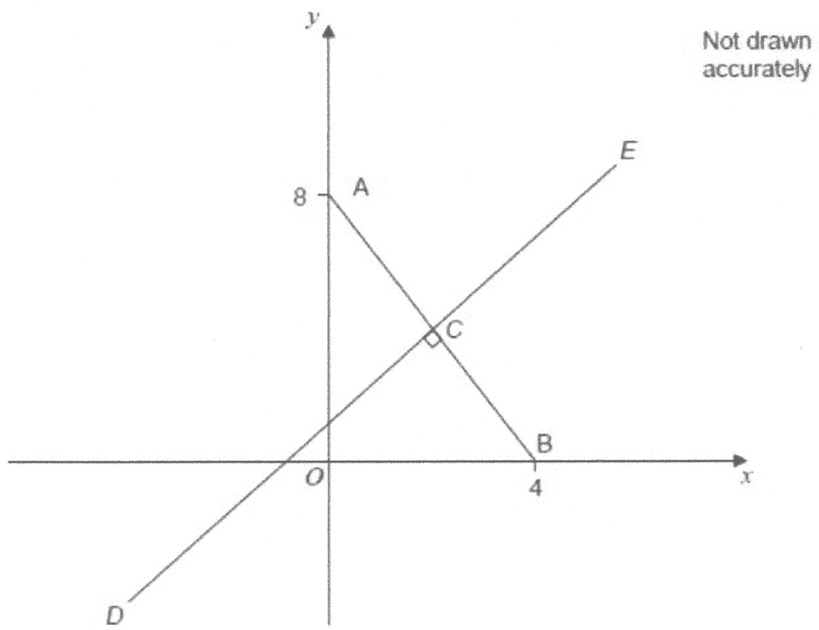
is perpendicular to the straight line through (2, 8) and (6, 15)

and

passes through (0, 9) and (x, 17)

Work out the value of x.

3) *ACB* is a straight line.
A is the point (0, 8), and *B* is the point (4, 0)
C is the midpoint of *AB*.
Line *DCE* is perpendicular to line *ACB*.



Work out the equation of line *DCE*.

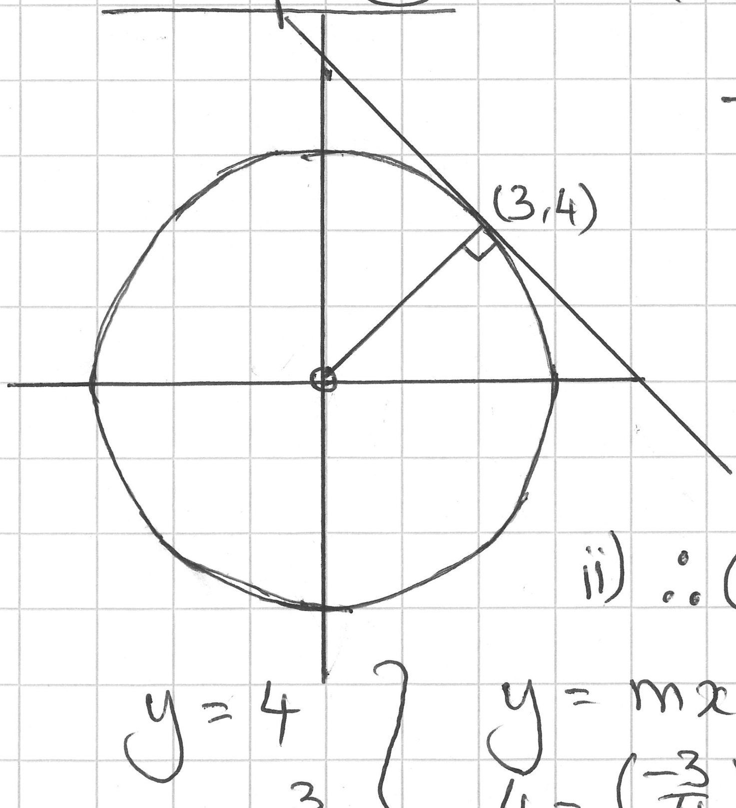
Yr 11 (H) - Revision - Equation of a circle & Tangent etc...

Examples The equation of a circle, with centre (0, 0) is always of the form

$$x^2 + y^2 = r^2 \quad (r = \text{radius}).$$

Eq^n of a circle with radius 8 cm.	Eq^n of a circle with diameter 8 cm $\rightarrow$ $(r=4)$
$\downarrow$	$\downarrow$
$x^2 + y^2 = 64.$	$x^2 + y^2 = 16$

Example (2) A circle has equation $x^2+y^2=25.$



Tangent touches circle at (3, 4). Eq^n of tangent?

i) Eq^n of radius?

$$y = \frac{4}{3}x$$

ii) $\therefore$ Gradient of tangent $= -\frac{3}{4}.$

$$\left.\begin{aligned} y &= 4 \\ m &= -\frac{3}{4} \\ x &= 3 \end{aligned}\right\}$$

$y = mx + c$

$4 = \left(-\frac{3}{4}\right)(3) + c$

$\underline{\underline{c = 6\frac{1}{4}}}$ $\rightarrow$ $\underline{\underline{y = -\frac{3}{4}x + 6\frac{1}{4}}}$

1) Which of these is the equation of a circle?

Circle your answer.

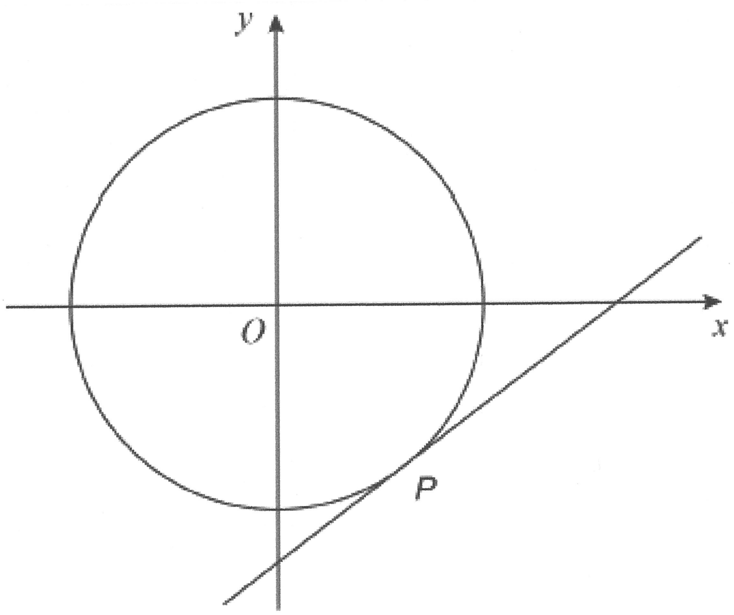
$x^2 - y^2 = 6$ $\qquad$ $x^2 + y^2 = 6$ $\qquad$ $y = x^2 - 6$ $\qquad$ $y = x^2 + 6$

2) A circle has equation $x^2 + y^2 = 25$

Work out the length of its radius.

3) P is a point on the circle with equation $x^2 + y^2 = 80$

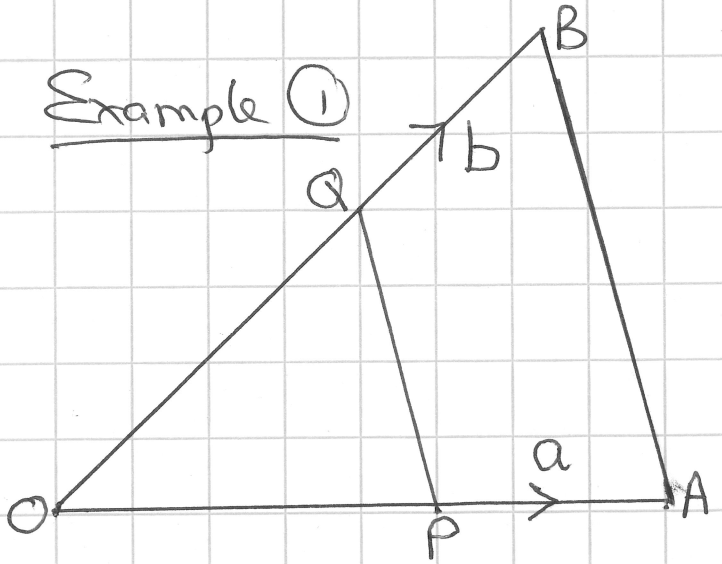
P has x-coordinate 4 and is below the x-axis.



Work out the equation of the tangent to the circle at P.

Yr 11(H) Revision – Vectors

Example 1



$\overrightarrow{PA} = a$ & $QB = b$.

$OQ : QB = 2:1$

$OP : PA = 2:1$

a) Vector PQ? $PQ = PO + OQ$

$= -2a + 2b$ or $2b - 2a$

$= \underline{\underline{2(b-a)}}$

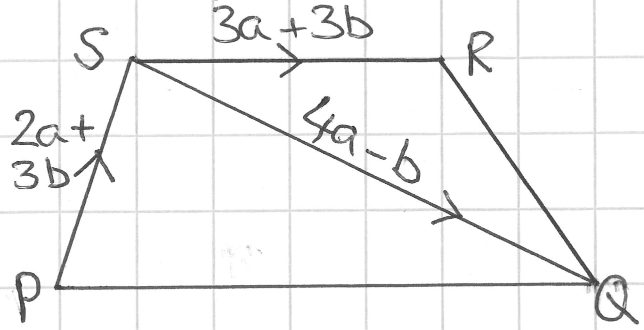
b) Show that AB & PQ are parallel.

ie- $AB = AO + OB$

$= -3a + 3b$ or $3b - 3a = \underline{\underline{3(b-a)}}$

Proven, because one is a multiple of the other.

Example 2



a) PQ?

$PQ = PS + SQ$

$= 2a+3b + 4a - b$

$= \underline{\underline{6a+2b}}$

b) Vector $RQ = RS + SP + PQ$

$= (-3a-3b) + (-2a-3b) + (6a+2b)$

$= \underline{\underline{a - 4b}}$

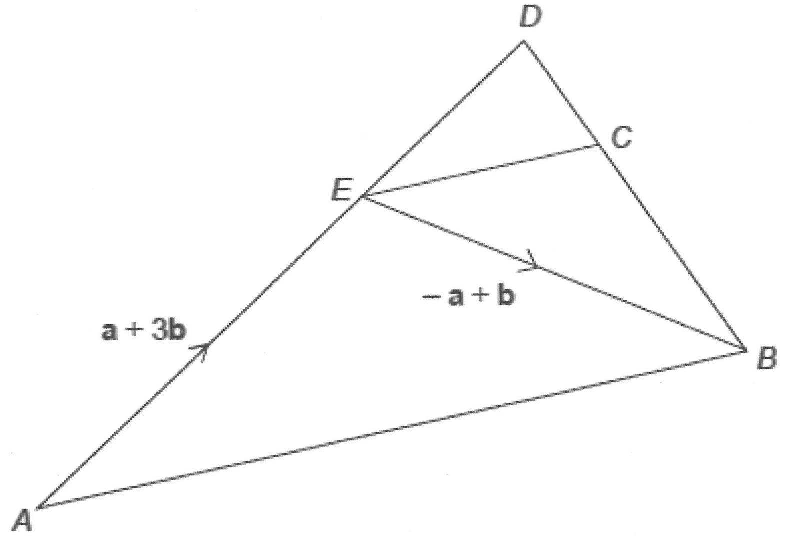
1)

AED is a straight line.

$\overrightarrow{AE} = \mathbf{a} + 3\mathbf{b}$

$\overrightarrow{EB} = -\mathbf{a} + \mathbf{b}$

Not drawn accurately

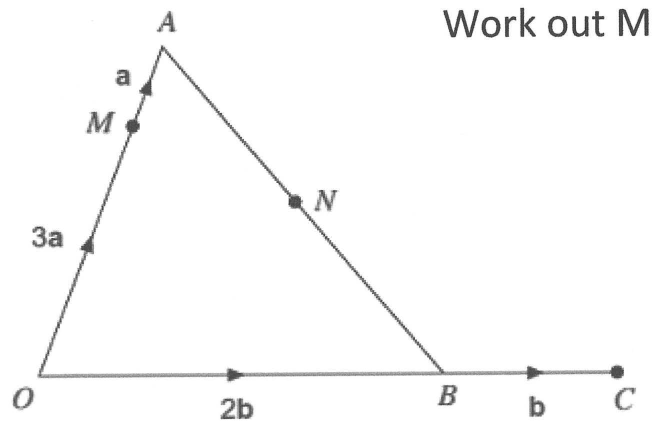


(a) Work out the vector $\overrightarrow{AB}$

(b) Also $\overrightarrow{ED} = \frac{1}{3}\overrightarrow{AE}$ and $\overrightarrow{DC} = -\frac{1}{3}\mathbf{a}$

Prove that *EC* is parallel to *AB*.

2)



Work out MN in terms of a and b