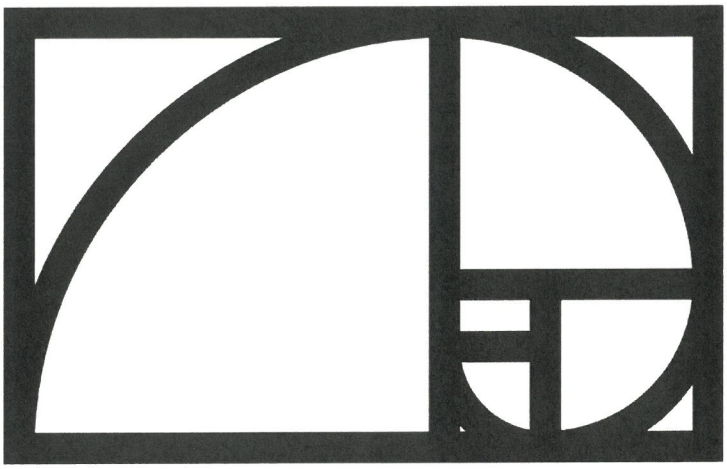
Mathematics
Transition to Year 11

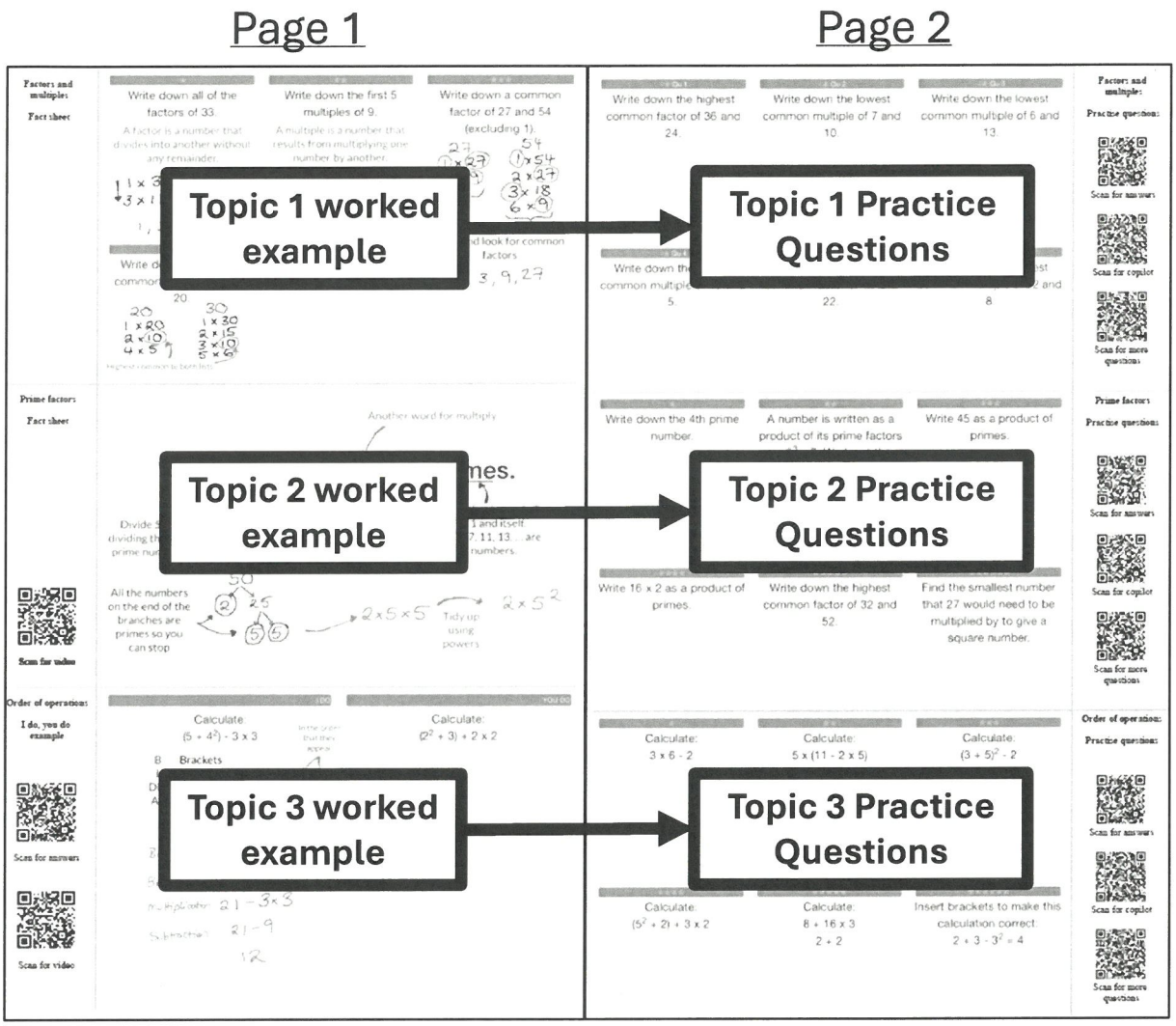
Higher



Name: _____

How to use this booklet

Work across each row of a double page.



Remember to use the solutions to mark your work.

Algebraic fractions

I do, you do example

Scan for answers

Scan for video

I DO

Simplify:

$$\frac{d^2}{d^2 + 14d + 48} \times \frac{d + 6}{d^3}$$

With algebraic fractions, you follow the normal techniques for operating with numeric fractions, but also use factorising to simplify where possible.

$$\frac{d^2}{(d^2 + 14d + 48)} \times \frac{d+6}{d^3}$$

Factorise

$$\equiv \frac{d^2}{(d+6)(d+8)} \times \frac{d+6}{d^3}$$

Cancel common factors

$$\equiv \frac{d^2(d+6)}{(d+6)(d+8)d^3} \equiv \frac{1}{d(d+8)}$$

YOU DO

Simplify:

$$\frac{a^2 + 15a + 56}{a^2 + 5a - 14} \times \frac{a - 2}{a + 7}$$

Change the subject

I do, you do example

Scan for answers

Scan for video

I DO

Make c the subject:

$cb - a = e$

To make c the subject we use inverse operations to isolate c on one side of the equals sign.

$$cb - a = e$$
$$+a \quad +a$$

$$cb = e + a$$
$$\div b \quad \div b$$

$$c = \frac{e+a}{b}$$

When something isn't divisible, leave the answer as a fraction

YOU DO

Make e the subject:

$ef + b = a$

Find y = mx + c from a graph

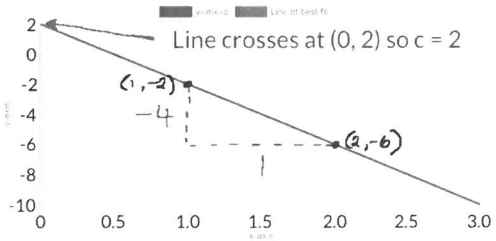
I do, you do example

Scan for answers

Scan for video

I DO

State $y=mx+c$ for:



Co-ordinates that satisfy the rule

$y = mx + c$

y-intercept (point of intersection of the line with the y-axis)

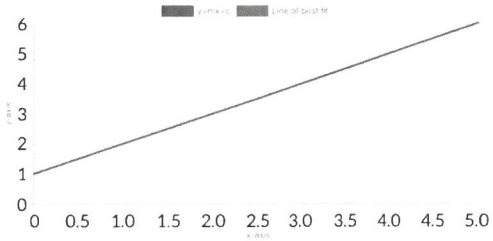
Gradient (steepness) = Change in y / Change in x

$$\frac{\text{change in } y}{\text{change in } x} = \frac{-6-(2)}{2-1} = \frac{-4}{1} = -4$$

$$y = -4x + 2$$

YOU DO

State $y=mx+c$ for:



Algebraic fractions

Practise questions

★

Simplify:

$$\frac{48a^7g^4}{6a^5g^7}$$

★★

Calculate:

$$\frac{a}{d} \div \frac{e}{h}$$

★★★

Simplify:

$$\frac{g^2 - 2g - 15}{gf - 5f}$$

★★★★

Simplify:

$$\frac{7c}{c - 3} \times \frac{c}{7}$$

★★★★★

Simplify:

$$\frac{3}{c + 7} - \frac{6}{2c + 3}$$

★★★★★★

Solve:

$$\frac{12}{f + 17} - \frac{9}{2f + 13} = 3$$

Scan for more questions

Change the subject

Practise questions

★

Make c the subject:

$$c + e = b$$

★★

Make d the subject:

$$dc - f = b$$

★★★

Make c the subject:

$$\frac{cb - a}{e} = d$$

★★★★

Make a the subject:

$$\frac{\sqrt{a - c}}{b} = e$$

★★★★★

Make r the subject:

$$A = \pi r^2$$

★★★★★★

Make c the subject:

$$e = ac + 2c$$

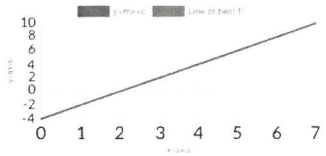
Scan for more questions

Find y = mx + c from a graph

Practise questions

★

What is the y-intercept?



★★

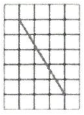
Calculate the gradient of the following line:

★★★

Calculate the gradient of the following line:

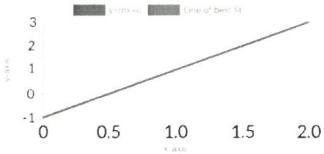
★★★★

Calculate the gradient of the following line:



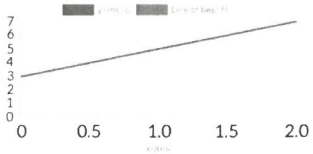
★★★★★

What is the gradient?



★★★★★★

State y=mx+c for:



Scan for more questions

Rearranging into the form y = mx + c

I do, you do example

Scan for answers

I DO

By rearranging the following into the form $y = mx + c$, what is the gradient value?

$y - 2x - 2 = 0$

Co-ordinates on the line

$y = mx + c$

Gradient

y-intercept

Rearranging:

$y - 2x - 2 = 0$

$+2 \quad +2$

$y - 2x = 2$

$+2x \quad +2x$

$y = 2x + 2$

Gradient is 2

YOU DO

By rearranging the following into the form $y = mx + c$, what is the gradient value?

$y - 4x = -5$

Find the equation of a parallel line

I do, you do example

Scan for answers

Scan for video

I DO

Write down the equation of a line parallel to $y = -5 + 8x$ that passes through the point (-3,-26).

The equation of a straight line always comes in the form:

Co-ordinates on the line

$y = mx + c$

Coefficient of x is the gradient

y-intercept

Parallel lines have the same gradient. With $y = -5 + 8x$, 8 is the gradient.

$y = 8x + c$

Use the given coordinate to find c:

$-26 = 8 \times -3 + c$

$-26 = -24 + c \rightarrow c = -2$

$y = 8x - 2$

YOU DO

Write down the equation of a line parallel to $y = -9x - 6$ that passes through the point (6,-48).

Quadratic and cubic functions

I do, you do example

Scan for answers

Scan for video

I DO

Draw the graph of

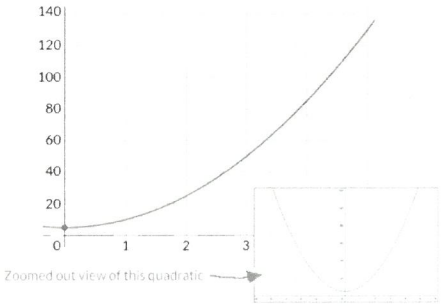
$y = 5x^2 + 5$

for $0 \leq x \leq 5$.

To draw a graph, construct a table of values:

x	0	1	2	3	4	5
x^2	0	1	4	9	16	25
$5x^2$	0	5	20	45	80	125
y	5	10	25	50	85	130

Now plot x against y:



YOU DO

Draw the graph of

$y = 4x^3 - 5x$

for $1 \leq x \leq 6$.

Rearranging into the form y = mx + c

Practise questions

3★ Qu 1

What is the y-intercept?

$y = 2x - 2$

3★ Qu 2

What is the gradient value?

$y = 7x + 2$

3★ Qu 3

By rearranging the following into the form $y = mx + c$, what is the y-intercept value?

$-7x + y = 2$

3★ Qu 4

By rearranging the following into the form $y = mx + c$, what is the gradient value?

$4x + y + 5 = 0$

3★ Qu 5

By rearranging the following into the form $y = mx + c$, what is the gradient value (leave as a fraction where appropriate)?

$6y + 8x = 3$

3★ Qu 6

By rearranging the following into the form $y = mx + c$, what is the y-intercept (leave as a fraction where appropriate)?

$8y - 9x = 4$

Scan for more questions

Find the equation of a parallel line

Practise questions

★

Line Q passes through (7,4) and (13,13). Line N passes through (-7,-10) and (-6,-8). Is line Q parallel to line N?

★★

Write down the equation of a line parallel to $y = 4x - 6$.

★★★

The equations of 2 lines are given below:

$y = 4x + 5$

$y = 4 - 4x$

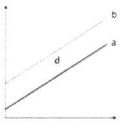
Are they parallel?

★★★★

Write down the equation of a line parallel to $y = -5 + 2x$ that passes through the point (9,11).

★★★★★

If line **a** is $y = 5x + 5$ and d = 6 units, find the equation of the parallel line **b**.



Scan for more questions

Quadratic and cubic functions

Practise questions

★

If $y = x^2$, complete the following table (rounding where appropriate):

x	-3	-2	-1	0
y				

★★

If $y = x^3 - 5x^2 + 2$, complete the following table (rounding where appropriate):

x	-1	0	1	2
y				

★★★

Draw the graph of $y = 4x^2 + 5$ for $-3 \leq x \leq 2$.

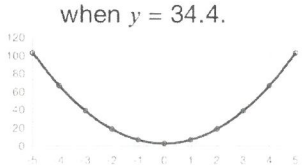
★★★★

Which function is shown?

$y=4x^2+5x$ or $y = 3x^3-4x$

★★★★★

Use the graph to find x when $y = 34.4$.



Scan for more questions

Solve linear equations (unknown both sides)

I do, you do example

Scan for answers

Scan for video

I DO

Solve

$7x + 3 = -74 - 4x$

The purpose of solving an equation is to find out the value of the unknown, x. A good first step is to get rid of x from one side of the equals sign:

$7x + 3 = -74 - 4x$ ← Remove the smaller number of x's

$+4x \quad +4x$

Use inverse operations to eliminate terms from one side

$11x + 3 = -74$

$-3 \quad -3$

$11x = -77$

$\div 11 \quad \div 11$

$x = 7$

YOU DO

Solve

$3 - 8x = -5 - 4x$

Expand 2 or more binomials

I do, you do example

Scan for answers

Scan for video

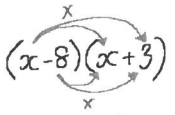
I DO

Expand

$(x - 8)(x + 3)$

Method 1 The claw

Method 2 The grid



×	x	$+3$
x	x^2	$+3x$
-8	$-8x$	-24

$x^2 + 3x - 8x - 24$

Simplify

$x^2 - 5x - 24$

YOU DO

Expand

$(x - 2)(x + 8)$

Factorise a quadratic expression

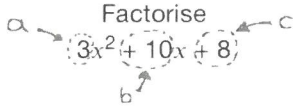
I do, you do example

Scan for answers

Scan for video

I DO

Factorise



To factorise, you want 2 numbers that multiply together to give ac but add together to give b.

$ac = 3 \times 8 = 24$ $\quad b = 10$

$4 \times 6 \quad 4 + 6$

Rewrite the problem with b separated into $4x$ and $6x$:

Factorise each half → $3x^2 + 6x + 4x + 8$

Must be the same

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

Fully factorise

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

YOU DO

Factorise

$2x^2 + 15x + 25$

Solve linear equations (unknown both sides)

Practise questions

★

Solve

$5x = 3x - 12$

★★

Solve

$5x + 2 = 3x + 14$

★★★

Solve

$8x + 4 = -8 - 4x$

★★★★

Solve

$10x + 6 = 2(2x - 18)$

★★★★★

I think of a number, I times it by 6 and I add 2. The answer is 2 times my number add 38. What was my number?

★★★★★★

Opposite sides of a rectangle are $(8x + 2)$cm and $(26 - 4x)$cm in length. Find the length of 1 side

Scan for more questions

Expand 2 or more binomials

Practise questions

★

Expand

$(x + 4)(x + 4)$

★★

Expand

$(x - 2)(x - 3)$

★★★

Expand

$(x + 4)(x - 4)$

★★★★

Expand

$(4x + 8)(8x + 3)$

★★★★★

Expand

$(3x^2 + 3)(5x^3 + 7)$

★★★★★★

Expand

$(x + 8)(x + 8)(x + 7)$

Scan for more questions

Factorise a quadratic expression

Practise questions

★

Factorise

$x^2 + 12x + 32$

★★

Factorise

$x^2 - 5x - 14$

★★★

Factorise

$x^2 - 7x + 10$

★★★★

Factorise

$x^2 - 36$

★★★★★

Factorise

$3x^2 + 16x + 16$

★★★★★★

Factorise

$12x^2 + 14x + 4$

Scan for more questions

Solve a quadratic by factorising

I do, you do example

Scan for answers

Scan for video

I DO

Solve the following quadratic by factorising:

$x^2 - 10x + 25 = 0$

The quadratic is in the form $ax^2 + bx + c$

To factorise a quadratic, think of 2 numbers that multiply to give ac and add to give b:

$ac = 1 \times 25 = 25 \quad b = -10$

So -5 and -5 — Split b in the quadratic into these 2 numbers

Factorise each side of the green line

$x^2 - 5x | -5x + 25 = 0$

$x(x-5) - 5(x-5) = 0$ — Common bracket

$(x-5)(x-5) = 0$

If the product of the 2 brackets is 0, it means 1 or both must equal 0 too:

$x - 5 = 0 \Rightarrow x = 5 \quad x - 5 = 0 \Rightarrow x = 5$

YOU DO

Solve the following quadratic by factorising:

$x^2 - 9x + 14 = 0$

Complete the square

I do, you do example

Scan for answers

Scan for video

I DO

Write the following expression in completed square form:

$x^2 + 4x - 1$

The completed square form is:

$(x + d)^2 + e$

$\frac{1}{2}b$ $\quad c - d^2$

So for a quadratic above that is written in the form $ax^2 + bx + c$:

$a = 1, b = 4$ and $c = -1$

$d = \frac{1}{2}(4) = 2$

$e = -1 - (2)^2 = -1 - 4 = -5$

$(x + 2)^2 - 5$

From this form, we can also get the turning point of the quadratic: (-2, -5)

YOU DO

Write the following expression in completed square form:

$x^2 - 6x - 2$

Solve a quadratic by completing the square

I do, you do example

Scan for answers

Scan for video

I DO

Solve the following quadratic by completing the square (leave in exact form):

$x^2 + 2x - 2 = 0$

Complete the square

$(x + 1)^2 - 2 - (1)^2 = 0$

$(x+1)^2 - 2 - 1 = 0$

$(x+1)^2 - 3 = 0$

Begin to rearrange to make x the subject

$(x+1)^2 = 3$

$x + 1 = \pm\sqrt{3}$

$x = -1 \pm \sqrt{3}$ — There are 2 answers in this case due to the + and - of the root of 3

YOU DO

Solve the following quadratic by completing the square (leave in exact form):

$x^2 - 4x - 4 = 0$

Solve a quadratic by factorising

Practise questions

★

Solve the following quadratic by factorising:

$x^2 + 10x + 21 = 0$

★★

Solve the following quadratic by factorising:

$x^2 - 3x - 18 = 0$

★★★

Solve the following quadratic by factorising:

$x^2 - 9x + 20 = 0$

★★★★

Solve the following quadratic by factorising:

$x^2 - 64 = 0$

★★★★★

Solve the following quadratic by factorising:

$2x^2 - 13x + 15 = 0$

★★★★★★

Solve the following quadratic by factorising:

$10x^2 + 23x + 12 = 0$

Scan for more questions

Complete the square

Practise questions

★

Find the value of a in the following:

$x^2 + 8x + 19 = (x + 4)^2 + a$

★★

Find the value of a in the following:

$x^2 - 18x + 88 = (x - 9)^2 + a$

★★★

Write the following expression in completed square form:

$x^2 - 2x - 7$

★★★★

Write the following expression in completed square form:

$x^2 + 7x + 7$

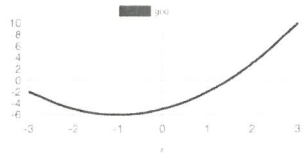
★★★★★

Find the minimum point of the following function:

$f(x) = x^2 - 6x - 3$

★★★★★★

$f(x) = x^2$ has translated to $g(x)$. Identify $g(x)$.



Scan for more questions

Solve a quadratic by completing the square

Practise questions

★

Solve the following quadratic by completing the square (leave in exact form):

$x^2 + 6x - 8 = 0$

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

★★

Solve the following quadratic by completing the square (leave in exact form):

$x^2 - 4x - 1 = 0$

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

★★★

Solve the following quadratic by completing the square (leave in exact form):

$x^2 - 2x - 4 = 0$

★★★★

Solve the following quadratic by completing the square (leave in exact form):

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

★★★★★

Solve the following quadratic by completing the square (to 2dp):

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

★★★★★★

Solve the following quadratic by completing the square (to 2dp):

$8x^2 + 17x - 18 = 0$

Scan for more questions

Iterations

I do, you do example

Scan for answers

Scan for video

I DO

Given $x_0 = 3$,
find x_3 to 2dp:

$$x_{n+1} = \sqrt[3]{\left(\frac{7x_n^2+9x_n+10}{3}\right)}$$

With iteration, you use the output from a calculation as the new input of the next one.

$x_1 = \sqrt[3]{\frac{7\times x_0^2+9\times x_0+10}{3}} = \sqrt[3]{\frac{7\times 3^2+9\times 3+10}{3}}$

$x_1 = Ans = 3.21829794$

$x_2 = \sqrt[3]{\frac{7\times Ans^2+9\times Ans+10}{3}} = 3.336886$

$x_3 = 3.40$ to 2dp

Use "Ans" on your calculator to bring in the answer to the previous calculation to save time. Click "=" to keep repeating the calculation.

YOU DO

Given $x_0 = 1$,
find x_3 to 2dp:

$$x_{n+1} = \sqrt[3]{\left(\frac{6x_n^2+7x_n+6}{10}\right)}$$

Read/Represent inequalities on a number line

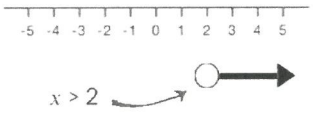
I do, you do example

Scan for answers

Scan for video

I DO

Identify the inequality:



Any value greater than 2 satisfies the inequality

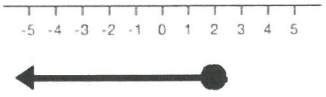
When representing an inequality on a number line, use:

- ○ hollow dot for < and >
- ● solid dot for ≤ and ≥

The arrow indicates the direction of the size of the numbers that satisfy the inequality.

YOU DO

Identify the inequality:



Understand geometric sequences

I do, you do example

Scan for answers

Scan for video

I DO

Given that the following is a geometric sequence, write the next 2 terms:
18, 54, 162, ...

Unlike an arithmetic sequence where you have a common difference between two terms, a geometric sequence has a common ratio.

Common ratio: $\frac{54}{18} = 3$ — To find the next term, multiply the previous term by 3

$162 \times 3 = 486$ $\quad 486 \times 3 = 1458$

The rule for this sequence could be represented by an iterative process:

$u_1 = 18$ $\quad u_{n+1} = 3u_n$

Next term ← Previous term

YOU DO

Given that the following is a geometric sequence, write the next 2 terms:
6, 12, 24, ...

Iterations

Practise questions

★

If $a_1 = 2$ and $a_{n+1} = 3a_n - 4$, find a_2.

★★

If $b_1 = 2$ and $b_{n+1} = 4b_n - 3$, find b_3.

★★★

The population, P, of Algebra town can be modelled by $P_{n+1} = 1.7(P_n + 40)$. In 2021, P = 1000. What is P in 2022?

★★★★

Given $x_0 = 1$, find x_3 to 2dp:

$$x_{n+1} = \sqrt[3]{\left(\frac{7x_n^2 - 7x_n + 8}{3}\right)}$$

★★★★★

Show that $11x^3 - 2x^2 - 6x - 10 = 0$ can be rearranged to produce the formula:

$$x_{n+1} = \sqrt[3]{\left(\frac{2x_n^2 + 6x_n + 10}{11}\right)}$$

★★★★★★

$2x^3 - 9x^2 - 5x - 7 = 0$ has a solution between 5 and 6. Find x to 2dp using:

$$x_{n+1} = \sqrt[3]{\left(\frac{9x_n^2 + 5x_n + 7}{2}\right)}$$

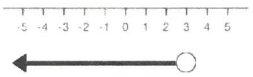
Scan for more questions

Read/Represent inequalities on a number line

Practise questions

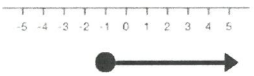
★

Identify the inequality:



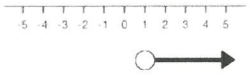
★★

Identify the inequality:



★★★

Identify the inequality:



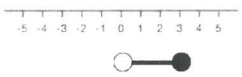
★★★★

Representing the following inequality on a number line:

$x > -4$

★★★★★

Identify the inequality:



★★★★★★

Represent the following inequality on a number line:

$-3 \leq x < -1$

Scan for more questions

Understand geometric sequences

Practise questions

★

Is it a geometric sequence?

2, 5, 7, 12, ...

★★

Given that the following is a geometric sequence, write the next 2 terms:

10, 20, 40, ...

★★★

Given that the following is a geometric sequence, write the next 2 terms:

3, 0.6, 0.12, ...

★★★★

A geometric sequence has a first term of 3 and a common ratio of 0.2. Find the first 3 terms.

★★★★★

If $u_1 = 8$, use the following to find u_3:

$u_{n+1} = 0.3u_n$

★★★★★★

Using the following rule, if $u_2 = 12$, find u_5:

$u_{n+1} = 3u_n$

Scan for more questions

Algebraic sequences

I do, you do example

Scan for answers

I DO

Here are the first 3 terms of an arithmetic sequence:

c , c + 2h , c + 4h

Find the nth term rule.

To find the nth term, we can use the general rule:

$a\,n + b$ — Common difference; 0th term

c-2h , c , c+2h , c+4h

-2h, +2h, +2h ← Common difference

0th term

$n^{th}\text{ term} = (2h)n + c - 2h$

$= 2hn - 2h + c$

$= 2h(n-1) + c$

YOU DO

Here are the first 3 terms of an arithmetic sequence:

e , e + 2a , e + 4a

Find the nth term rule.

Solve linear simultaneous equations

I do, you do example

Scan for answers

Scan for video

I DO

Find the value of a and b:

Label the equations

① 5a + 3b = 32

② 4a + 2b = 24

Take multiples of the two equations (if required) to get either the coefficient of a or b the same

① x2 ③ 10a + 6b = 64

② x3 ④ 12a + 6b = 72

Eliminate b

④ - ③ $2a = 8$

$a = 4$

If a = 4 use an equation to now find b.
Substitute a into the equation:

① $5 \times 4 + 3b = 32$

$20 + 3b = 32$

$3b = 12$

$b = 4$

YOU DO

Find the value of a and b:

5a + 2b = 16

2a - 4b = -8

Form expressions and equations

I do, you do example

Scan for answers

I DO

I think of a number (n), I subtract 3 and then multiply it by 6. Write an expression, in terms of n, to represent my number.

Statements like these always provide order that we need to preserve when considering BIDMAS.

① I think of a number n

② I subtract 3 n-3

③ multiply by 6 6(n-3)

(n - 3) is placed in brackets to ensure the subtraction happens before the multiplication.

YOU DO

I think of a number (n), I add 6 and then multiply it by 3. Write an expression, in terms of n, to represent my number.

Algebraic sequences

Practise questions

★

Here are the first 3 terms of an arithmetic sequence:
3h , 3h + g , 3h + 2g
Find the next 2 terms.

★★

Here are the first 3 terms of a geometric sequence:
e , ea , ea^2
Find the next 2 terms.

★★★

Here are the first 3 terms of an arithmetic sequence:
2d , 2d + g , 2d + 2g
Show that the 6th term is:
2d + 5g

★★★★

Here are the first 3 terms of an arithmetic sequence:
3d , 3d + g , 3d + 2g
Find the nth term rule.

★★★★★

Here are the first 3 terms of an arithmetic sequence:
2c , 2c + 2e , 2c + 4e
If the third term is 10 and the sixth term is 28, find c and e.

Scan for more questions

Solve linear simultaneous equations

Practise questions

★

Find the value of a and b:
a + 7b = 50
a + 6b = 44

★★

Find the value of a and b:
5a + b = 22
8a - b = 17

★★★

Find the value of a and b:
3a + 5b = 32
2a + 4b = 24

★★★★

In a fish and chip shop, 4 packs of chips and 2 fish costs £14 but 5 packs of chips and 2 fish costs £16. How much is i) 1 bag of chips? ii) 1 fish?

★★★★★

Find the value of a and b:
5a + 2b = 14
4a = 2 + 3b

★★★★★★

If $a = 2^p$, $b = 2^q$, $ab = 16$ and $2ab^3 = 512$, find the value of p and q.

Scan for more questions

Form expressions and equations

Practise questions

★

Ashton is 5 years older than Liam. If Ashton is y years old, how old is Liam?

★★

I think of a number (n), I multiply it by 3 and add 2. Write an expression, in terms of n, to represent my number.

★★★

I think of a number (n), I add 2 and then divide it by 4. Write an expression, in terms of n, to represent my number.

★★★★

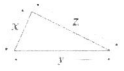
Steve is y years old.
Matt is 2 years older than Steve.
Sue is 6 years younger than Steve. Find the sum of their ages.

★★★★★

I think of a number (n), I multiply it by 9 and then add 7. If the answer is my original number subtract 17. What is my number?

★★★★★★

If $x = n + 6$, $y = n - 8$ and $z = 3n + 4$, write a formula for the perimeter, P, in terms of n.



Scan for more questions

Plans and elevations

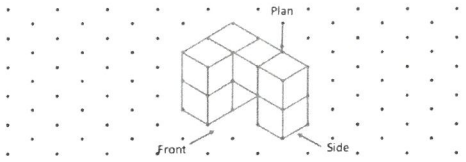
I do, you do example

Scan for answers

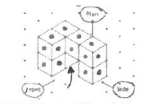
Scan for video

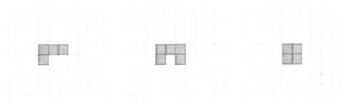
I DO

Draw the plan, front and side elevation for the following shape:



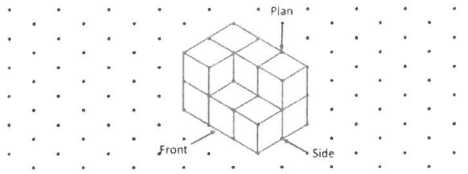
A plan view is a drawing of the shape from above (bird's eye view). It is often a good idea to colour the sides that you would see from each perspective to help draw the different views.





YOU DO

Draw the plan, front and side elevation for the following shape:



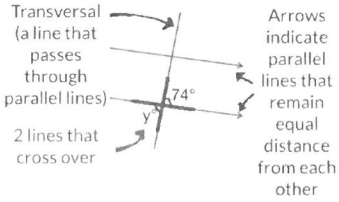
Angles on parallel lines

Fact sheet

Scan for video

1★ Qu 1

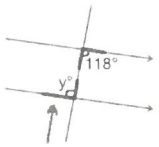
Find y and give a reason.



y = 74° since y and 74° are vertically opposite angles

1★ Qu 2

Find y and give a reason.

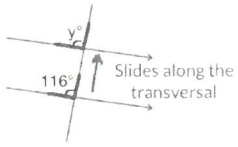


y is on the alternate side of the transversal and on the other parallel line

y = 118° since y and 118° are alternate angles

1★ Qu 3

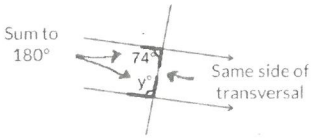
Find y and give a reason.



y = 116° since y and 116° are corresponding angles

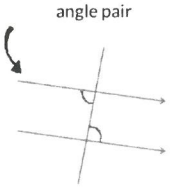
1★ Qu 4

Find y and give a reason.

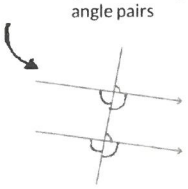


y = 106° since y and 74° are co-interior angles

Another example of an alternate angle pair



Other examples of corresponding angle pairs



Angles in polygons

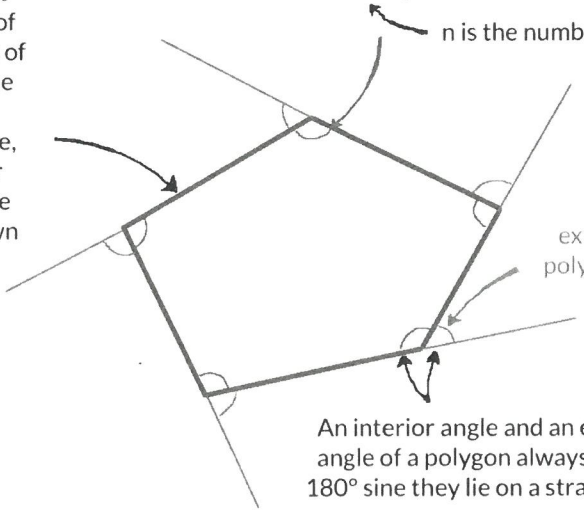
Fact sheet

Scan for video

A polygon is a 2D shape with a finite number of straight sides and number of angles. If the length of all the sides and the size of all of the angles are the same, it will be a regular polygon. If they are different, it is known as an irregular polygon.

The sum of all interior angles can be found using: (n - 2) x 180

n is the number of sides



The sum of all exterior angles of a polygon sums to 360°.

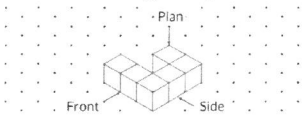
An interior angle and an exterior angle of a polygon always sum to 180° sine they lie on a straight line.

Plans and elevations

Practise questions

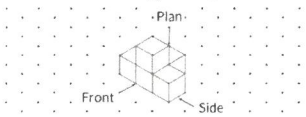
★

How many cubes would be needed to construct the following shape?



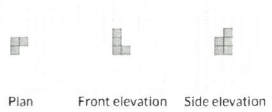
★★

Draw the plan, front and side elevation for the following shape:



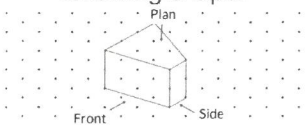
★★★

Using isometric paper, draw the solid from the following views:



★★★★

Draw the plan, front and side elevation for the following shape:



★★★★★

Using isometric paper, draw the solid shape from the following views:

★★★★★★

The front elevation of a solid shape is a triangle. The side elevation is a triangle. The plan is a square. What is the name of the solid shape?

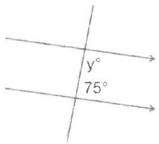
Scan for more questions

Angles on parallel lines

Practise questions

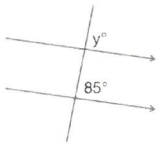
1★ Qu 1

Find y and give a reason.



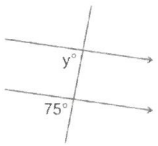
1★ Qu 2

Find y and give a reason.



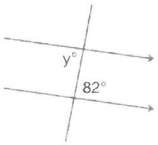
1★ Qu 3

Find y and give a reason.



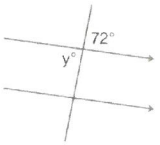
1★ Qu 4

Find y and give a reason.



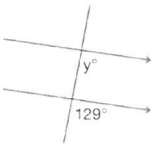
1★ Qu 5

Find y and give a reason.



1★ Qu 6

Find y and give a reason.



Scan for more questions

Angles in polygons

Practise questions

★

Find the interior angle sum of a 13-sided polygon.

★★

7 of the angles in a 8-sided polygon are 118°, 131°, 124°, 133°, 134°, 130° and 132°. Calculate the size of the last angle.

★★★

Will a regular 8-sided polygon tessellate? Give a reason for your answer.

★★★★

How many sides does a regular n-sided polygon have if 1 exterior angle is 21.2° (rounded to 1 decimal place)?

★★★★★

The interior angle of a regular n-sided polygon 128.6° (rounded to 1 decimal place). Calculate the value of n.

★★★★★★

An equilateral triangle is placed inside a regular pentagon as shown. Calculate the size of the marked angle.

Scan for more questions

Area/Volume scale factors

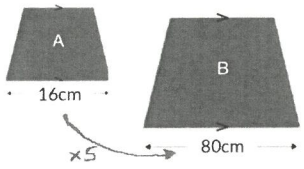
I do, you do example

Scan for answers

Scan for video

I DO

A and B are similar shapes. The area of A is $80cm^2$. Find the area of B?



Similar shapes are 2 of the same shape but different in size.

Their lengths are linked by a scale factor.
Their areas are linked by (scale factor)^2.
Their volumes are linked by (scale factor)^3.

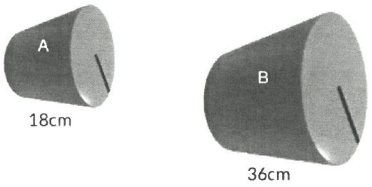
Scale factor $= \frac{80}{16} = 5$

Area scale factor $= 5^2 = 25$

So area of shape B $= 80 \times 25 = 2000cm^2$

YOU DO

A and B are similar. The volume of B is $720cm^3$. Find the volume of A?



Congruence

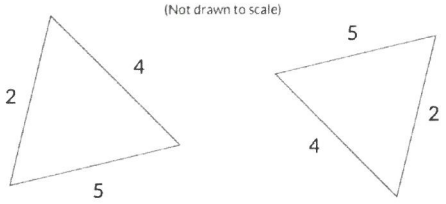
I do, you do example

Scan for answers

I DO

The two triangles are congruent. State the condition of congruence.

(Not drawn to scale)



Congruent means one shape can become another by rotating, reflecting or translating it.

Two triangles are congruent if:

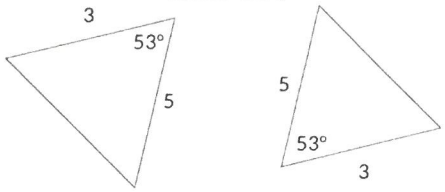
SSS - 3 sides are equal
ASA - 2 angles & a corresponding side are equal
AAS - 2 angles & a corresponding side are equal
SAS - 2 sides & the angle between them are equal
RHS - A right angle, hypotenuse & a corresponding side are equal

Here SSS is satisfied

YOU DO

The two triangles are congruent. State the condition of congruence.

(Not drawn to scale)



Similar shapes

I do, you do example

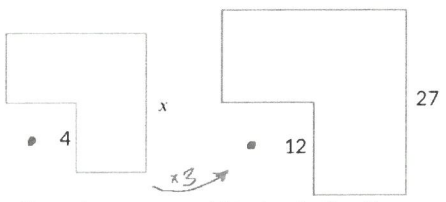
Scan for answers

Scan for video

I DO

The two shapes are similar. Find the value of x.

(Not drawn to scale)



Two shapes are said to be similar if one shape can become another after resizing (and rotating, reflecting or translating)

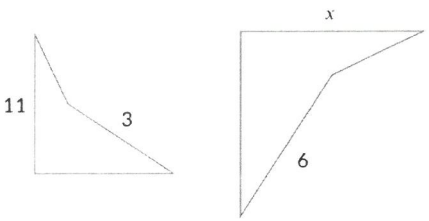
The lengths of the sides in one shape will have a scale factor of the same corresponding side in the other.

Scale factor of corresponding sides $\frac{12}{4} = 3$ so $x \times 3 = 27$, $x = 9$

YOU DO

The two shapes are similar. Find the value of x.

(Not drawn to scale)

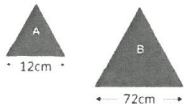


Area/Volume scale factors

Practise questions

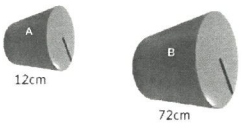
★

A and B are similar shapes. The area of A is $36cm^2$. Find the area of B?



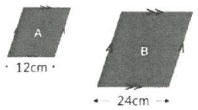
★★

A and B are similar. The volume of A is $60cm^3$. Find the volume of B?



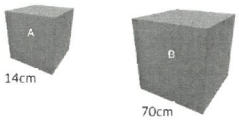
★★★

A and B are similar shapes. The area of B is $192cm^2$. Find the area of A?



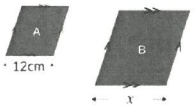
★★★★

A and B are similar. The volume of B is $8750cm^3$. Find the volume of A?



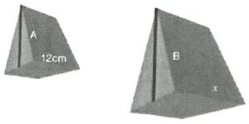
★★★★★

A and B are similar. The area of A is $48cm^2$ and B is $3072cm^2$. Find x?



★★★★★★

A and B are similar. The volume of A is $60cm^3$ and B is $3840cm^3$. Find x.



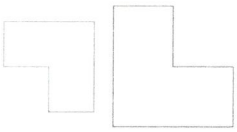
Scan for more questions

Congruence

Practise questions

★

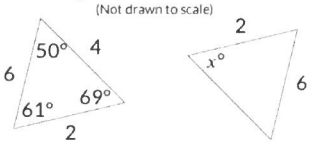
Are the two shapes congruent?



★★

The two triangles are congruent. What is x?

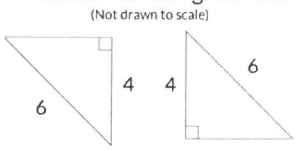
(Not drawn to scale)



★★★

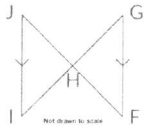
The two triangles are congruent. State the condition of congruence.

(Not drawn to scale)



★★★★

If FG = IJ, prove that triangle FGH is congruent to HIJ.



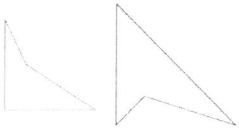
Scan for more questions

Similar shapes

Practise questions

★

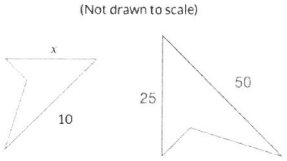
Are the two shapes similar?



★★

The two shapes are similar. Find the value of x.

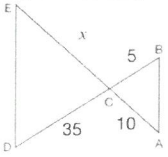
(Not drawn to scale)



★★★

Triangle ABC is similar to CDE. Find the value of x.

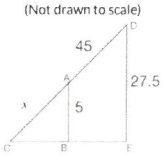
(Not drawn to scale)



★★★★

If AB=5, DE=27.5 and AD=45, what is AC?

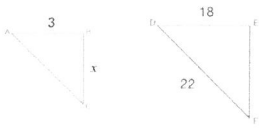
(Not drawn to scale)



★★★★★

Triangle ABC is similar to DEF. Find the value of x to the nearest integer.

(Not drawn to scale)



Scan for more questions

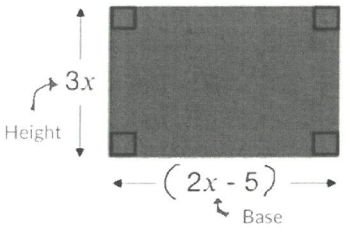
Algebraic area of 2D shapes

I do, you do example

Scan for answers

I DO

Write an expression to represent the area of the following shape:



To calculate the area of a rectangle, multiply the base by the perpendicular height:

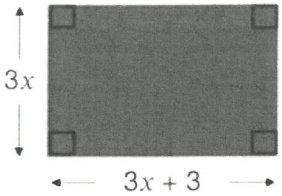
Area = $(2x-5) \times 3x$ (Expand)

$= 2x \times 3x - 5 \times 3x$

$= (6x^2 - 15x)\ cm^2$

YOU DO

Write an expression to represent the area of the following shape:



Circumference of a circle

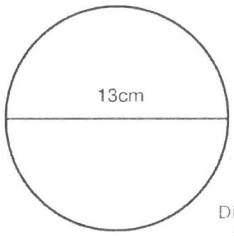
I do, you do example

Scan for answers

Scan for video

I DO

Calculate the circumference to 1dp.



Use the formula: (Distance from 1 side of a circle to the other through the middle)

Circumference = π x diameter

Perimeter of a circle — Find it on your calculator

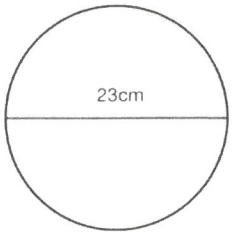
$C = \pi \times 13$ (In terms of π)

$C = 13\pi\ cm$

$C = 40.8\ cm$ (To 1 d.p.)

YOU DO

Calculate the circumference to 1dp.



Area of a circle

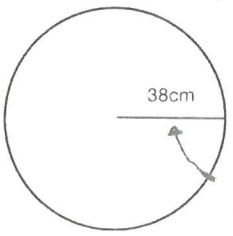
I do, you do example

Scan for answers

Scan for video

I DO

Find the area to 1dp.



Distance from the centre of a circle to the circumference

Use the formula:

Area of a circle = π x radius^2 (Square the radius)

Find it on your calculator

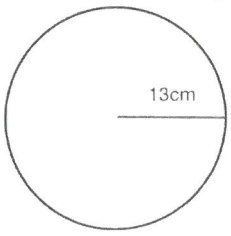
$A = \pi \times 38^2$ (Answer in terms of π)

$A = 1444\pi\ cm^2$

$A = 4536.5\ cm^2$ (To 1 d.p.)

YOU DO

Find the area to 1dp.

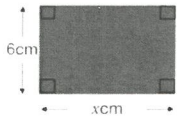


Algebraic area of 2D shapes

Practise questions

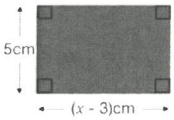
★

Write an expression to represent the area of the following shape.



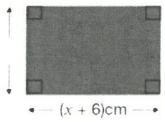
★★

Write an expression to represent the area of the following shape.



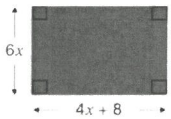
★★★

The area of the following shape is $(6x + 36)cm^2$. What is the length of the missing side.



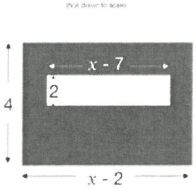
★★★★

Write an expression to represent the area of the following shape.



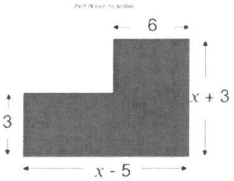
★★★★★

Calculate the shaded area.



★★★★★★

Write an expression to represent the area of:



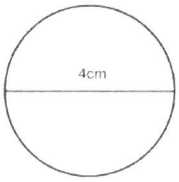
Scan for more questions

Circumference of a circle

Practise questions

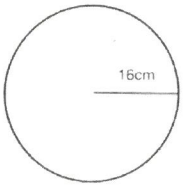
★

Calculate the circumference to 1dp.



★★

Calculate the circumference to 1dp.

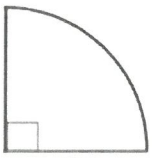


★★★

If the circumference of a circle is 47.1cm to 1dp, calculate the diameter of the circle to 1dp.

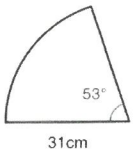
★★★★

Find the perimeter to 1dp.



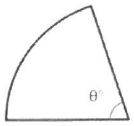
★★★★★

Find the perimeter to 1dp.



★★★★★★

If the perimeter is 38.5cm to 1 dp, calculate θ to 1dp.



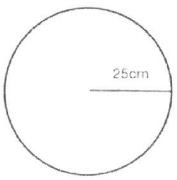
Scan for more questions

Area of a circle

Practise questions

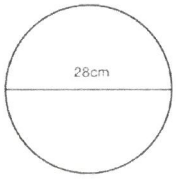
★

Find the area to 1dp.



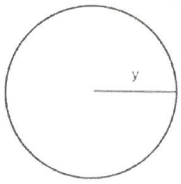
★★

Find the area to 1dp.



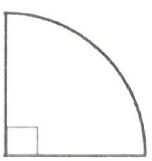
★★★

If the area is $153.9cm^2$, calculate y to 1dp.



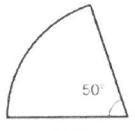
★★★★

Find the area to 1dp.



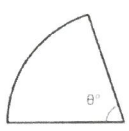
★★★★★

Find the area to 1dp.



★★★★★★

If the area is $37.5cm^2$ to 1 dp, calculate θ to 1dp.



Scan for more questions

Apply SOH CAH TOA

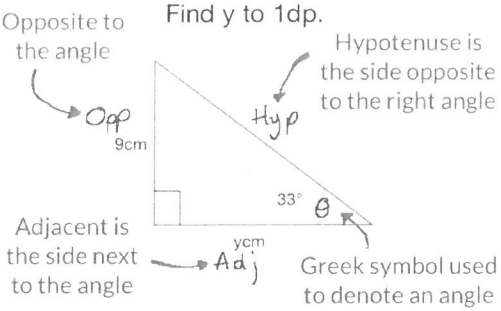
I do, you do example

Scan for answers

Scan for video

I DO

Find y to 1dp.



Choose from:

$\sin\theta = \frac{Opp}{Hyp}$ $\cos\theta = \frac{Adj}{Hyp}$ $\tan\theta = \frac{Opp}{Adj}$

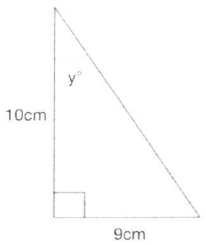
Use this since we have opp and need adj

$\tan(33) = \frac{9}{y}$ $y = \frac{9}{\tan(33)} \approx 13.9cm$

Rearrange

YOU DO

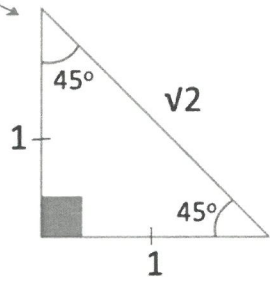
Find y to 1dp.



Trigonometry exact values

Fact sheet

Isosceles right angled triangle

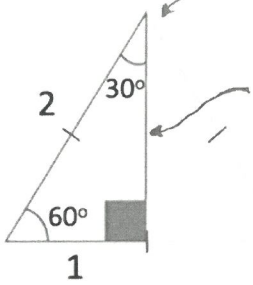


You can use this triangle to find sin 45, cos 45 and tan 45 using SOH CAH TOA:

$\sin 45 = \frac{1}{\sqrt{2}}$ $\cos 45 = \frac{1}{\sqrt{2}}$ $\tan 45 = 1$

Don't forget that if you know sin 45, you also know sin 135, sin 405, sin 495, etc, thanks to interpreting equivalences on a sine curve

Equilateral triangle divided into 2



Use Pythagoras to find the height of the triangle

$\sqrt{2^2-1^2} = \sqrt{3}$

You can use this triangle to find sin 30, sin 60, cos 30, cos 60, tan 30 and tan 60 using SOH CAH TOA:

$\sin 30 = \frac{1}{2}$ $\cos 30 = \frac{\sqrt{3}}{2}$ $\tan 30 = \frac{1}{\sqrt{3}}$

$\sin 60 = \frac{\sqrt{3}}{2}$ $\cos 60 = \frac{1}{2}$ $\tan 60 = \sqrt{3}$

This also applies to cos and tan graphs too. Equivalences for any angle can also be read from the graph.

Volume of 3D shapes

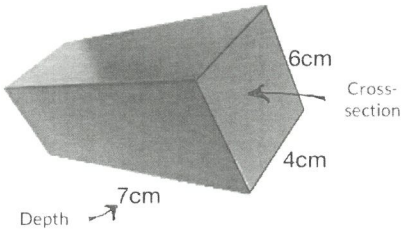
I do, you do example

Scan for answers

Scan for video

I DO

Calculate the volume of the cuboid:



To calculate the volume of a prism or 3D shape where the cross-section is the same throughout, use:

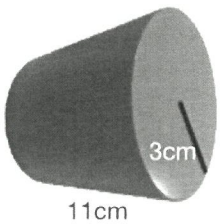
Volume = Area of cross-section x Depth

Volume = $(6 \times 4) \times 7 = 168cm^3$

Note the units of volume

YOU DO

Calculate the volume to 1dp.

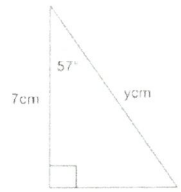


Apply SOH CAH TOA

Practise questions

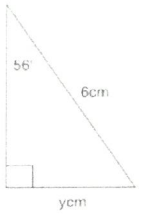
★

Using cos 57° ≈ 0.5, find y to 1dp:



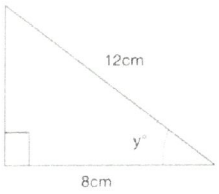
★★

Find y to 1dp.



★★★

Find y to 1dp.

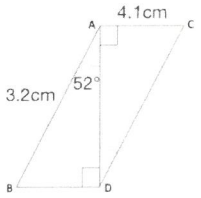


★★★★

ABCD is a parallelogram. AB is 2.5cm. AD is 9.1cm. BAD is 49°. Calculate the height of the parallelogram to 1dp.

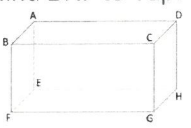
★★★★★

Find ADC to 1dp.



★★★★★★

Given FG = 9.8cm, GH = 3.9cm and DH = 2.5cm, find BHF to 1dp:



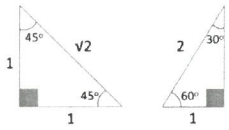
Scan for more questions

Trigonometry exact values

Practise questions

★

Using the triangles, find the exact value of tan 60°.



★★

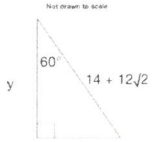
Find the exact value of: cos 45°

★★★

Find the exact value of: sin 45° + cos 60°

★★★★

Find the exact value of y.

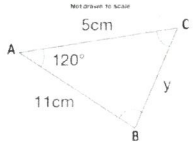


★★★★★

Find the exact value of: sin 120°

★★★★★★

Find the exact value of y.



Scan for more questions

Volume of 3D shapes

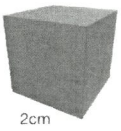
Practise questions

★

What is the correct mathematical name for the following shape?

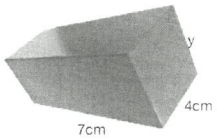
★★

Calculate the volume of the following cube:



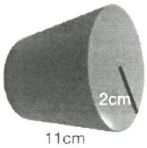
★★★

The cuboid has a volume of $56cm^3$. Calculate y.



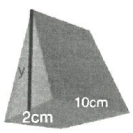
★★★★

Calculate the volume to 1dp.



★★★★★

The volume of the prism is $50cm^3$. Calculate y.



Scan for more questions