YEAR 12 – BRIDGING UNITS

# A-LEVEL MATHEMATICS

ST HILDA'S COLLEGE

The 6th Form
@ St Hilda's

bridging units

Name:

Anything is POSSIBLE

# Welcome to A-level maths

**Setting yourself up for success**

To ensure you make a smooth start to advanced study, you need to have solid GCSE skills in several areas. To demonstrate you are secure in these topics, you will complete an Induction Test during the week commencing 14th September 2026. **Please prepare by practising questions from the topics below and attempting (and marking) the attached sample test.** The QR codes link to resources on the Corbett Maths website but you can use your preferred sites from GCSE. This preparation should take no longer than 10 hours.

| Topic | Questions | Done? |
|---|---|---|
| Expand & simplify | | |
| Algebraic fractions (expressions) | | |
| Algebraic fractions (equations) | | |
| Pythagoras | | |
| Trigonometry SOHCAHTOA | | |

| Topic | Questions | Done? |
|---|---|---|
| Trigonometry Graphs | | |
| Trigonometry Sine & Cosine rules | | |
| Quadratic equations - factorising | | |
| Quadratic equations – use the formula | | |
| Quadratic equations – complete the square | | |

| Topic | Questions | Done? |
|---|---|---|
| Indices | | |
| Simultaneous equations | | |
| Change the subject | | |
| Equations of lines | | |
| Equations of circles | | |

## Stationary & equipment

For the duration of the course you will need:

- 3 or 4 lever arch folders with dividers
- Lined paper
- A casio scientific calculator*:
  either a FX-991CW or FX-991EX
- A casio graphical calculator*:
  either a fx-CG50 or fx-CG100

*We have a limited stock of calculators to loan out to students for the duration of the course.

College students who meet the requirements for Bursary funding are encouraged to use this for their learning resources.

## Closing words

If you encounter any problems, please email mmurray@st-hildas.co.uk.

We look forward to meeting you properly in your first lessons in September,

Mrs Murray, Miss Harrison & Mr Walsh

# Practice Induction Test

**Calculator allowed. No formula sheet will be supplied – you are expected to know the quadratic formula, sine and cosine rules at A-level.**

1. Expand and simplify
   (a) $(a + 3)^2$ (b) $4x(3x – 2) – x(2x + 5)$

2. (a) Factorise $4y^2 – 9$ (b) Write $4x^2 – 8x + 7$ in the form $a(x + b)^2 + c$

3. Simplify
   (a) $\dfrac{4x^3y}{8x^2y^3}$ (b) $\dfrac{3x+2}{3} + \dfrac{4x-1}{6}$

4. Solve the following equations
   (a) $\dfrac{h-1}{4} + \dfrac{3h}{5} = 4$ (b) $x – 3 = \dfrac{x+2}{x-2}$

5. Write each of the following as single powers of $x$ and y
   (a) $\dfrac{1}{x^4}$ (b) $(x^2y)^3$ (c) $\dfrac{x^5}{x^{-2}}$

6. Solve each of the following equations. Show your method clearly and give exact solutions.
   (a) $6t^2 – 13t + 5 = 0$ (b) $5x^2 – x = 1$

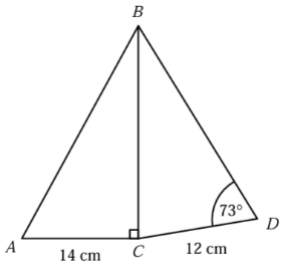
7. Rearrange the following equations to make $x$ the subject
   (a) $v^2 = u^2 + 2ax$ (b) $V = \frac{1}{3}\pi x^2 h$ (c) $y = \dfrac{x+2}{x+1}$

8. The points A(3, 0), B(-3, 2) and C (-2, k) are the vertices of a triangle where <ABC=90°.
   (a) Find the gradient of line AB
   (b) Calculate the value of k
   (c) Find an equation of the line which passes through A and C.

9. A circle has equation $x^2 + y^2 = 34$. The point P lies on the circle.
   The coordinates of P are (-3, 5). The line L is tangent to the circle at point P.
   Find an equation of L. Give your answer in the form y = mx + c

10. Find the coordinates of the points at which the line with equation y = x – 4 intersects with the curve $y^2 = 2x^2 – 17$

11. ABC and BCD are triangles.
    The area of triangle ABC is 154 cm².
    Work out the size of angle ABD.



# Practice Induction Test – Solutions

1a) $(a+3)^2 = (a+3)(a+3)$
$= a^2 + 6a + 9$

b) $4x(3x-2) - x(2x+5)$
$= 12x^2 - 8x - 2x^2 - 5x$
$= 10x^2 - 13x.$

2a) $4y^2 - 9 = (2y+3)(2y-3)$

b) $4x^2 - 8x + 7 = 4(x^2 - 2x) + 7$
$= 4[(x-1)^2 - 1] + 7$
$= 4(x+1)^2 - 4 + 7$
$= 4(x+1)^2 + 3$

3a) $\frac{4x^3y}{8x^2y^3} = \frac{x}{2y^2}$

b) $\frac{3x+2}{3} + \frac{4x-1}{6}$
$= \frac{6x+4}{6} + \frac{4x-1}{6}$
$= \frac{6x+4+4x-1}{6} = \frac{10x+3}{6}.$

4a) $\frac{h-1}{4} + \frac{3h}{5} = 4$ ⟩ ×4
$h - 1 + \frac{12h}{5} = 16$ ⟩ ×5
$5(h-1) + 12h = 80$
$5h - 5 + 12h = 80$
$17h = 85$
$h = 5$

4b) $x - 3 = \frac{x+2}{x-2}$
$(x-3)(x-2) = x+2$
$x^2 - 5x + 6 = x + 2$
$x^2 - 6x + 4 = 0$

or use quadratic formula

$(x-3)^2 - 9 + 4 = 0$
$(x-3)^2 = 5$
$x - 3 = \pm\sqrt{5}$
$x = 3 \pm \sqrt{5}$

5a) $x^{-4}$ b) $x^6y^3$ c) $x^7$

6a) $6t^2 - 13t + 5 = 0$ *
$t = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
$= \frac{13 \pm \sqrt{169 - 4(6)(5)}}{2(6)}$
$= \frac{13 \pm \sqrt{49}}{12}$
$= \frac{13 \pm 7}{12}$ → 5/3 or 1/2

since this is a square * will factorise

b) $5x^2 - x = 1$
$5x^2 - x - 1 = 0$
$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
$= \frac{1 \pm \sqrt{1 - 4(5)(-1)}}{2(5)}$
$= \frac{1 \pm \sqrt{21}}{10}$

7) a) $v^2 = u^2 + 2ax$

$v^2 - u^2 = 2ax$

$x = \frac{v^2 - u^2}{2a}$

b) $V = \frac{1}{3}\pi x^2 h$

$\frac{3V}{\pi h} = x^2$

$x = \pm\sqrt{\frac{3V}{\pi h}}$

c) $y = \frac{x+2}{x+1}$

$y(x+1) = x+2$

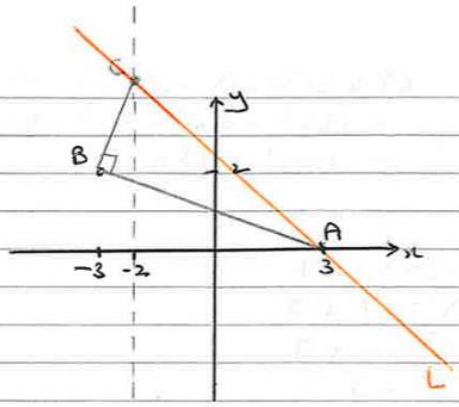
$xy + y = x + 2$

$xy - x = 2 - y$

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

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

8)




a) gradient $_{AB} = \frac{\Delta y}{\Delta x} = \frac{-2}{6} = -\frac{1}{3}$

b) $\therefore$ gradient BC = 3

ie) 1 right, 3 up from B to C

C (2, 5)

$\uparrow$ k = 5

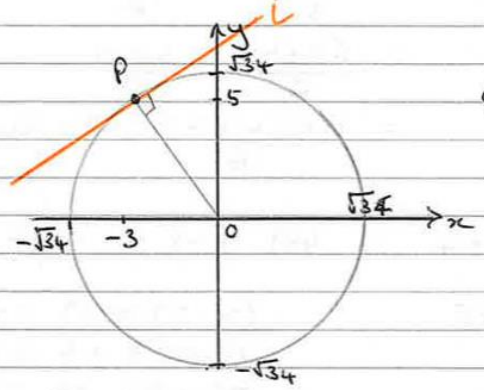
c) gradient AC $= \frac{\Delta y}{\Delta x} = \frac{-5}{5} = -1$ A(3,0)

$y = -x + c$ ← Sub

$0 = -3 + c$

$c = 3$ $y = -x + 3$.

9)




gradient PO $= \frac{\Delta y}{\Delta x} = -\frac{5}{3}$

$\therefore$ gradient L $= \frac{3}{5}$ (-3, 5)

$y = \frac{3}{5}x + c$ ← Sub

$5 = \frac{3}{5}(-3) + c$

$5 = -\frac{9}{5} + c$

$c = 5 + \frac{9}{5} = \frac{34}{5}$

10) $y = x - 4$ $\quad y^2 = 2x^2 - 17$

sub

$(x-4)^2 = 2x^2 - 17$

$x^2 - 8x + 16 = 2x^2 - 17$

$0 = x^2 + 8x - 17 - 16$

$0 = x^2 + 8x - 33$

$0 = (x+11)(x-3)$

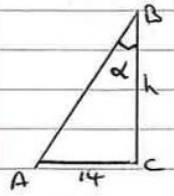
$x = 3$ $\quad x = -11$

$y = x - 4 = -1$ $\quad y = x - 4 = -15$

$(3, -1)$

$(-11, -15)$

11)

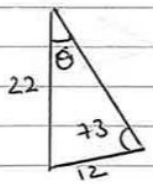



area $= 154$

$\frac{1}{2} \times 14 \times h = 154$

$7h = 154$

$h = 22$




$\frac{22}{\sin 73} = \frac{12}{\sin\theta}$

$\sin\theta = \frac{12 \sin 73}{22}$

$\theta = \sin^{-1}\left(\frac{12 \sin 73}{22}\right)$

$\theta = 33.441\ldots$

$\tan\alpha = \frac{14}{h} = \frac{14}{22} = \frac{7}{11}$

$\alpha = \tan^{-1}\left(\frac{7}{11}\right) = 32.47119°$

$\angle ABD = \alpha + \theta$

$= 63.9°$ (3sf).