

Maths

Summer Homework



AS to A2

It's a long summer! Working through these questions before you come back in September will give you the best possible start to your AS maths studies at JKHS.

We suggest doing them in August, so they'll be fresh in your mind when you start here.

There are notes to help and the answers are at the end so you know if you got them right. If you're stuck or made an error there are mymaths links to help you (username: jkhs password: build)

AS CORE MATHS QUICK FIRE REVIEW 1

1. Simplify the following:	
a) $243^{\frac{3}{5}}$	
b) $\left(15\frac{5}{8}\right)^{\frac{2}{3}}$	
2. Factorise the following:	
a) $4x^2 - 25$	
b) $12x^2 - 7x + 1$	
3. Simplify these surds:	
a) $\sqrt{12} + 3\sqrt{75}$	
b) $\frac{\sqrt{27}}{\sqrt{3}}$	
4. For $y = x^2 + 5x - 6$	
i) In completed square form	
ii) As a product of linear factors (factorise)	
iii) Using your answers to a) sketch the graph clearly labelling the key features	
5. Express $\frac{4 - \sqrt{2}}{\sqrt{2} - 1}$ in the form $a\sqrt{2} + b$	

AS CORE MATHS QUICK FIRE REVIEW 2

1. Without using a calculator and showing all of the working, find a value for the following

a) $4^{\frac{1}{4}} \times 2^3 \times 4^{\frac{3}{4}}$

b) $\frac{8^{\frac{1}{2}} \times 2^{\frac{1}{2}}}{16^{\frac{1}{4}}}$

2. Sketch the following graphs on the same axes

a) $y = 2 - 3x$
 $y = x^2 - 2$

b) Solve the equation: $x^2 - 2 = 2 - 3x$

c) Use your answers to a) and b) to solve the inequality
 $x^2 - 2 > 2 - 3x$

3. Rationalise the denominators:

a) $\frac{\sqrt{2}}{3\sqrt{3}}$

b) $\frac{2}{\sqrt{5}-1}$

c) $\frac{2-\sqrt{3}}{\sqrt{11}-4}$

4. Expand and simplify	
$(2x-3)(x+2)(x-1)$	

AS CORE MATHS QUICK FIRE REVIEW 3

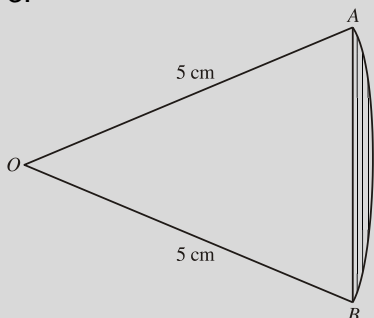
1.	
Express $\frac{5\sqrt{2}}{\sqrt{2} + \sqrt{3}}$ in the form $a + b\sqrt{c}$	
2.	
Sketch the following graphs $y = 4 - x^2$ and $y = 2x + 1$ the same axes labelling all important features. Hence solve the inequality $4 - x^2 > 2x + 1$	
3. The equation $y = 2x^2 - 5x + c$ has two distinct real roots.	
a) Write down the discriminant	
b) Hence or otherwise find all of the values of c for which this is true	
4. Find the equation of the line that is parallel to $y = \frac{1}{2}x + 3$ and passes through the point (2,-1)	
5.	
Find the value of the gradient of the curve $y = 3x^4 - 7x^3 + 2x - 3$ at the point $x = -1$	

6.	
a) Find the equation of the circle with centre (4, 3) and radius 5.	
b) Find the co-ordinates of the points where the circle cuts the x axis.	

AS CORE MATHS QUICK FIRE REVIEW 4

1. Differentiate the following functions with respect to x	
a) $y = \frac{1}{2}x^2 + 3x - 1$	
b) $y = 4x^3 - 5x$	
c) $y = 24 - 4x^2$	
2. What are the gradients and intercepts of the following straight lines:	
a) $x + 2y = 5$	
b) $\frac{2x + 1}{y} = 5$	

3.



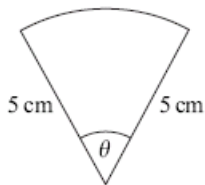
The diagram shows a sector OAB of a circle, centre O , of radius 5 cm and a shaded segment of the circle. Given that $\angle AOB = 0.7$ radians, calculate

a) the area, in cm^2 , of the sector OAB ,	
b) the area, in cm^2 to 2 significant figures, of the shaded segment.	

AS CORE MATHS QUICK FIRE REVIEW 5

1. Sketch $y = -(x - 2)^2$ labelling the important features

2. The diagram shows a sector of a circle of radius 5 cm and angle θ radians.



The area of the sector is 8.1 cm^2 .

a) Show that $\theta = 0.648$.

b) Find the perimeter of the sector.

3. For the function $f(x) = x^3 - 3x^2 - 4x + 12$

a) Find $f(-1)$, $f(-2)$ and $f(-3)$,
hence find a factor of $f(x)$

b) Use your answer to a) to fully factorise
the function $f(x)$

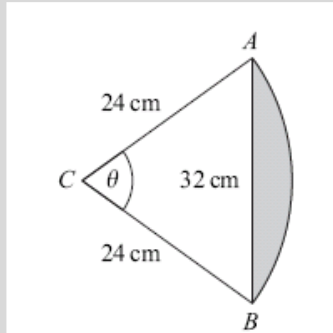
c) Solve the equation $f(x) = 0$

AS CORE MATHS QUICK FIRE REVIEW 6

1. A circle has the equation $x^2 + y^2 - 4x + 2y - 4 = 0$	
(a) Write the equation in the form $(x-a)^2 + (y-b)^2 = r^2$	
(b) Hence write down the radius, and the coordinates of the centre.	
2. Two numbers differ by 1 and have a product of 10.	
If n is the smallest number. a) Explain why $n^2 + n - 10 = 0$	
b) Find the exact values of the two numbers	
3.	
$(x-1)$ is a factor of the equation $f(x) = 2x^3 + 5x^2 + ax - 6$ a) Use the factor theorem to find a .	
b) Fully factorise and solve the equation $f(x) = 0$	
4. A quadratic function has vertex at $(-2,1)$ express the function in the form $f(x) = x^2 + bx + c$	
5. Simplify and hence solve the equation	
$(x+1)(x+3) + (x+3)(x-5) = 0$	

AS CORE MATHS QUICK FIRE REVIEW 7

1. The diagram shows a triangle ABC and the arc AB of a circle whose centre is C and whose radius is 24 cm.



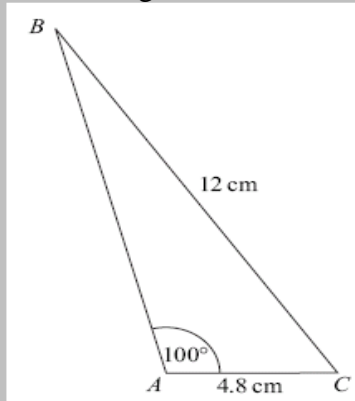
The length of the side AB of the triangle is 32 cm. The size of the angle ACB is θ radians.

a) Show that $\theta = 1.46$ correct to three significant figures.

b) Calculate the length of the arc AB to the nearest cm.

c) Calculate the area of the shaded segment to the nearest cm^2 .

2. The diagram shows a triangle ABC.

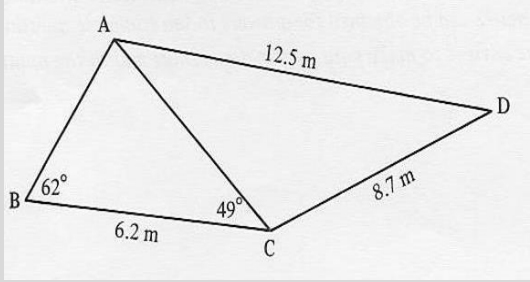


The lengths of AC and BC are 4.8 cm and 12 cm respectively. The size of angle BAC is 100° .

a) Show that angle ABC = 23.2° correct to 3 significant figures.

b) Calculate the area of triangle ABC, giving your answer correct to 3 significant figures.

AS CORE MATHS QUICK FIRE REVIEW 8

1. Solve	
a) $\cos x = 0.4$ for $0 < x < 720^\circ$.	
b) $\sin x = -0.3$ for $0 < x < 360^\circ$.	
c) $\tan x = 1.6$ for $-360 < x < 360^\circ$.	
d) $\sin 3x = 0.76$ for $0 < x < 180^\circ$.	
2. In a quadrilateral ABCD, $BC = 6.2$ m, $AD = 12.5$ m, $CD = 8.7$ m, angle $ABC = 62^\circ$ and angle $ACB = 49^\circ$.	
	
a) Calculate the length of the diagonal AC, correct to 1 d.p.	
b) Show that angle $ADC = 25^\circ$, to the nearest degree	
c) Calculate the area of the triangle ADC correct to 3 s.f.	

Answers:

Review 1

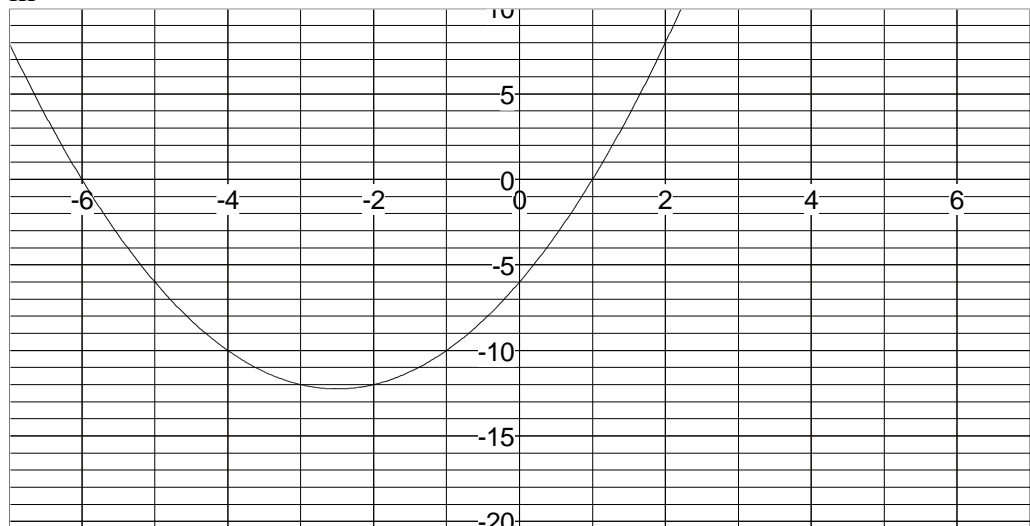
1a 27 b 25/4

2a $(2x - 5)(2x + 5)$ b $(4x - 1)(3x - 1)$

3a $17\sqrt{3}$ b 3

4i $\left(x + \frac{5}{2}\right)^2 - \frac{49}{4}$ ii $(x + 6)(x - 1)$

iii

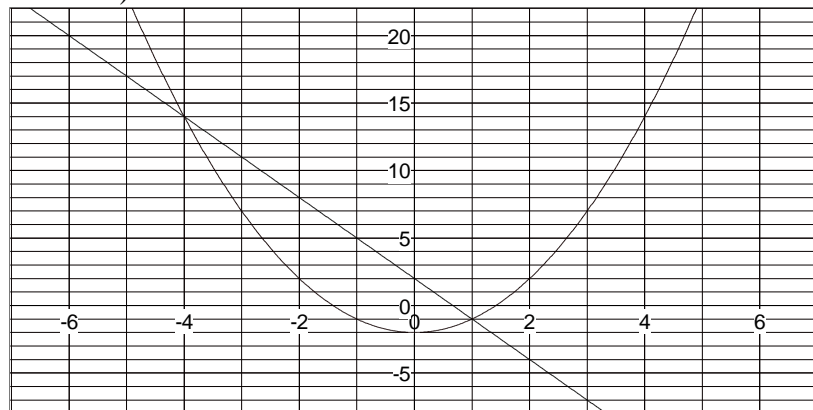


5 $3\sqrt{2} + 2$

Review 2

1a 32 b 2

2 a)



b $x = 1$ or $x = -4$ c $x < -4$ or $x > 1$

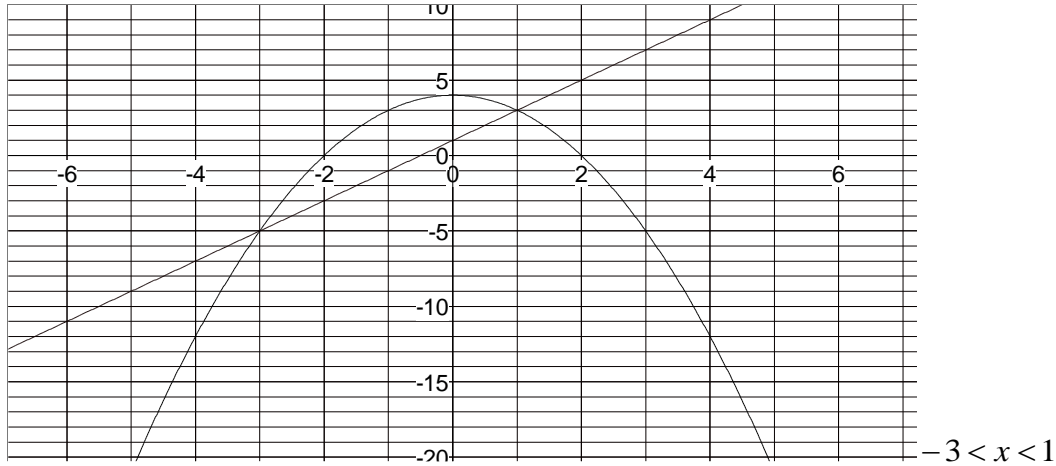
3a $\frac{\sqrt{6}}{9}$ b $\frac{\sqrt{5} + 1}{2}$ c $\frac{\sqrt{33} + 4\sqrt{3} - 2\sqrt{11} - 8}{5}$

4 $2x^3 - x^2 - 7x + 6$

Review 3

1 $5\sqrt{6} - 10$

2



3a $D = 25 - 8c$ b $c < \frac{25}{8}$

4 $2y = x - 4$

5 $\frac{dy}{dx} = 12x^3 - 21x^2 + 2$ so when $x = -1$

$\frac{dy}{dx} = -31$

6a $(x-4)^2 + (y-3)^2 = 25$ b $(0,0)$ and $(8,0)$

Review 4

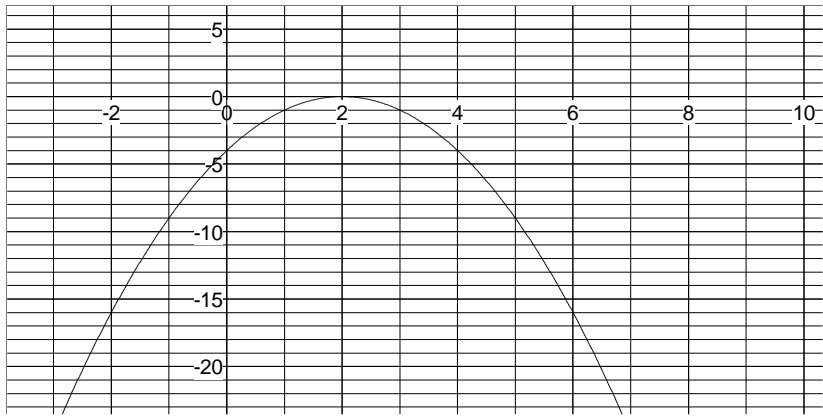
1a $\frac{dy}{dx} = x + 3$ b $\frac{dy}{dx} = 12x^2 - 5$ c $\frac{dy}{dx} = -8x$

2a $m = -\frac{1}{2}$ $c = \frac{5}{2}$ b $m = \frac{2}{5}$ $c = \frac{1}{5}$

3a Area = 8.75 b Area of triangle = 8.053 Area of segment = 0.70

Review 5

1



2a as given b perimeter = $5 + 5 + 3.24 = 13.24$

3a $f(-1) = 12$ $f(-2) = 0$ $f(-3) = -30$ → factor is $(x + 2)$

b $(x + 2)(x + 1)(x - 6)$ c $x = -1, 6, -2$

Review 6

1a $(x - 2)^2 + (y + 3)^2 = 3^2$ b $r = 3$, centre = $(2, -1)$

2a $a - n = 1$ and $an = 10$ so $\frac{10}{n} - n = 1$ therefore $n^2 + n - 10 = 0$

b $n = \frac{-1 \pm \sqrt{41}}{2}$

3a $a = -1$ b $f(x) = (x + 1)(2x + 3)(x + 2)$, so roots $x = -2, -1, -\frac{3}{2}$

4 $y = (x + 2)^2 + 1 = x^2 + 4x + 5$

5 $x = -3, 2$

Review 7

1a as given b length = 35 c Area seg = 134

2a as given b area = 24.1

Review 8

1a $x = 66.4, 293.6, 426.4, 653.6$ b $x = 197.5, 342.5$

c $x = -302, -122, 58, 238$ d $x = 16.5, 43.5, 136.5, 163.5$

2a find angle BAC = 69 deg, then sine rule gives AC = 5.9

b use cosine rule, answer as give c Area = 23.0