



## Further Mathematics Summer Work

### Text Books

For Year 12 A level Further Maths you will need 3 text books:

Edexcel AS and A level Further Mathematics  
Core Pure Mathematics  
Year 1/AS  
ISBN: 978-1-292-18333-6

Edexcel AS and A level Further Mathematics  
Further Mechanics 1  
FM1  
ISBN: 978-1-292-18331-2

Edexcel AS and A level Further Mathematics  
Further Pure Mathematics 1  
FP1  
ISBN: 978-1-292-18335-0

There is one other book (Core Pure Mathematics 2) that you will need for the second year of the course.

### Further Maths Summer Work

The following questions are hard GCSE level questions. What we are looking for is how well you can communicate mathematically ..... a list of correct answers will score you some marks, but **well explained**, **coherent** and **concise** solutions will score you many more marks.

Write your solutions on lined or squared A4 paper. Answers should be simplified and exact numerical solutions are preferred, unless stated otherwise.

The first 10 questions should be done without the help of a calculator.

1. Put the following in order of size, smallest first

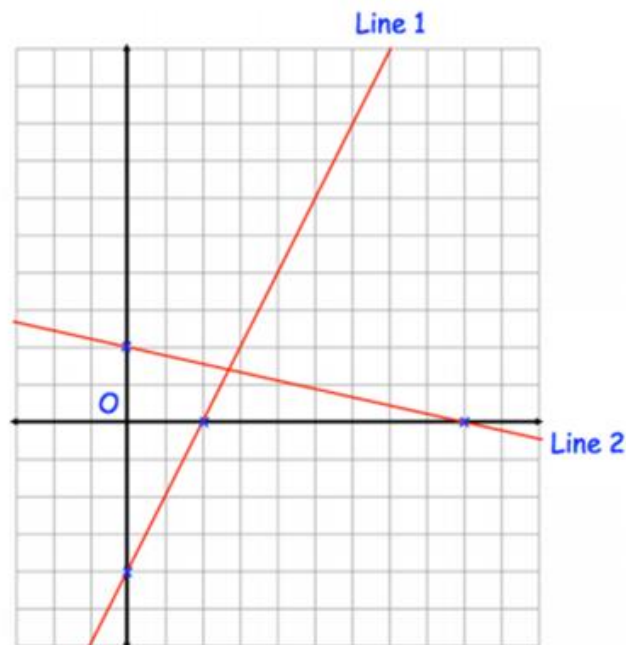
$$\frac{8}{\sqrt{3}} \quad , \quad \sqrt{6} \times \sqrt{2} \quad , \quad \sqrt{48} - \sqrt{27}$$



2. Let  $f(x) = x^2 + 3x - 2$  and  $h(x) = x + 3$
- Find  $fh(x)$
  - Find  $hf(x)$
3. a) Express  $3 - 10x - x^2$  in the form  $n - (x + m)^2$
- Hence, solve  $3 - 10x - x^2 = 0$

4. Express  $\frac{(1 + \sqrt{5})}{(2 + \frac{5}{\sqrt{5}})}$  in the form  $a + \sqrt{b}$  where both  $a$  and  $b$  are integers.

5. Shown are two straight lines drawn on the grid.



Line 1 has equation  $y = 3x - 12$

- Find the equation of Line 2



b) Are the lines perpendicular? Explain your answer.

6. Hannah is solving a quadratic equation in the  $ax^2 + bx + c = 0$   
She has got to this point in her working out:

$$x = \frac{3 \pm \sqrt{29}}{2}$$

Find the values of  $a$ ,  $b$  and  $c$  for the equation Hannah is solving.

7. Show that the following surd expression can be written as  $\sqrt{a}$ , where  $k$  and  $a$  are integers.

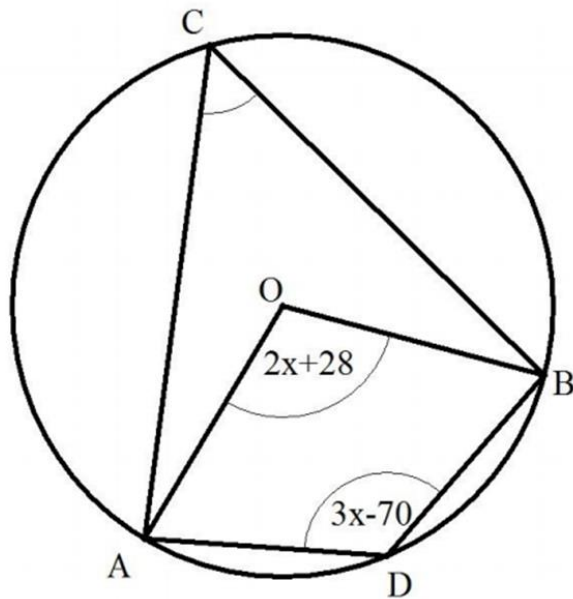
$$\frac{4}{3} \sqrt{\frac{300}{4}} + \frac{10}{\sqrt{3}}$$

8. Points A, B C and D are all on the circumference of the circle. O represents the centre.

$$\text{Angle AOB} = 2x + 28$$

$$\text{Angle ADB} = 3x - 70$$

Calculate the value of  $x$  giving reason for each stage of your working.

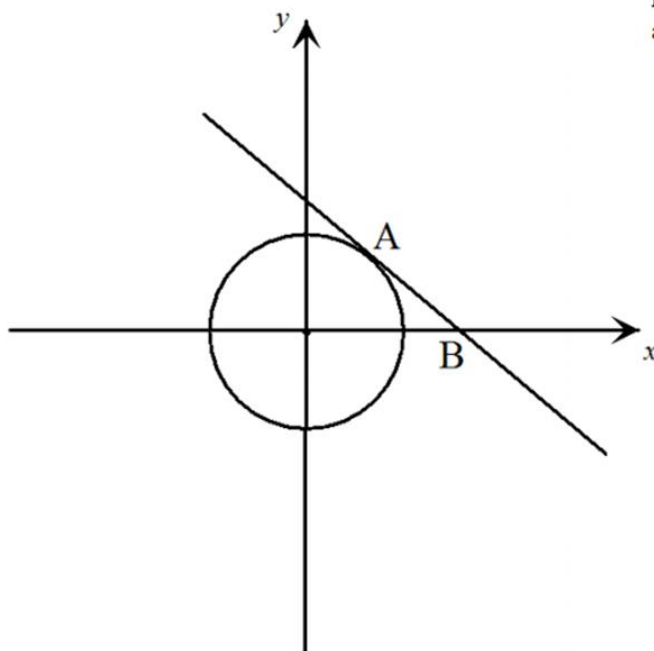


9. Consider the circle with equation  $x^2 + y^2 = 13$  sketched below.

The point A lies on the circle and has a y

coordinate of 2.

The tangent to the circle at A intersects the x axis at the point B. Find the coordinates of B.



Not Drawn accurately

10. The diagram shows a hexagon  $ABCDEF$ .

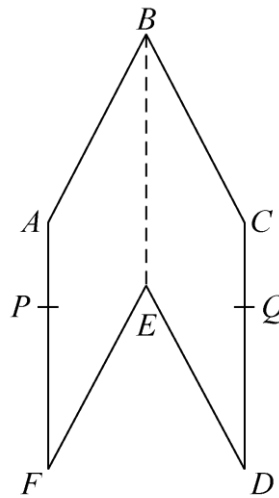
$ABEF$  and  $CBED$  are congruent parallelograms where  $AB = BC = x$  cm.

$P$  is the point on  $AF$  and  $Q$  is the point on  $CD$  such that  $BP = BQ = 10$  cm.



Given that angle  $ABC = 30^\circ$ ,

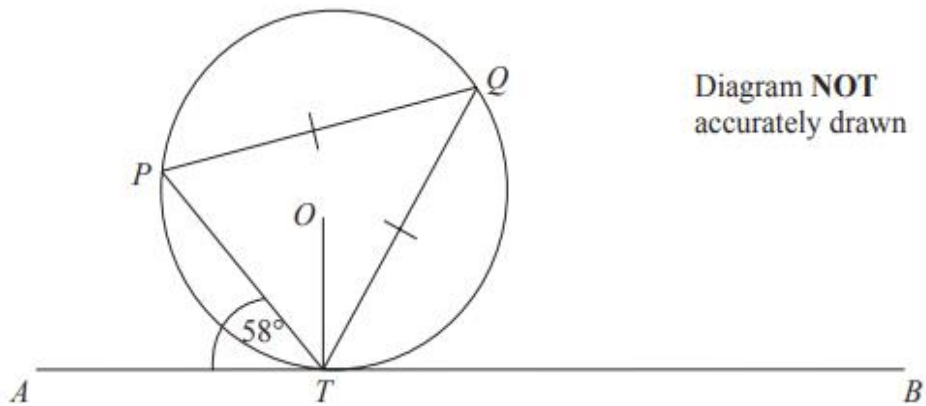
prove that  $\cos PBQ = 1 - \frac{(2-\sqrt{3})}{200} x^2$



From here on you may use a calculator

11. Solve simultaneously  $y - 2x = 3$   
 $x^2 + y^2 = 18$

12.



P, Q and T are points on the circumference of a circle, centre O. The line ATB is the tangent at T to the circle.

$PQ = TQ$                       Angle  $ATP = 58^\circ$

Calculate the size of angle OTQ. Give a reason for each stage of you working.



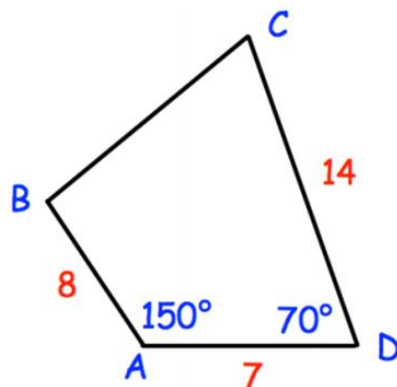
13. Ahmed played a game at the fair. He had to pick 2 balls from a bag of 50 whilst blindfolded. There were a range of different coloured balls in the bag. He took 2 out and handed them to the person running the game. Both balls were black. She looked at the two balls and said: "The probability of you doing this is  $\frac{4}{175}$ " What is the maximum number of red balls that could have been in the bag at the start?

14. A curve has an equation  $y = 2x^2 - 11x - 15$

- a) Write  $y = 2x^2 - 11x - 15$  in the form  $y = a(x + m)^2 + n$
- b) Find the coordinates of the minimum point of the graph.
- c) Does the graph of  $y = 2x^2 - 11x - 15$  cross the x axis? If yes, then find the exact coordinates of the points of intersection.

15. In quadrilateral ABCD, AD = 7cm, AB = 8cm and CD = 14cm.

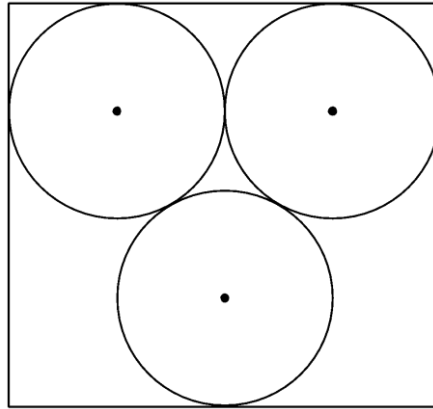
Angle BAD =  $150^\circ$  and angle ADC =  $70^\circ$ . Calculate the length BC. Give your answer correct to 3 significant figures.



16. The diagram shows 3 identical circles inside a rectangle.



Each circle touches the other two circles and the sides of the rectangle, as shown in the diagram.



The radius of each circle is 24 mm. Work out the area of the rectangle.

Give your answer correct to 3 significant figures.

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End of questions. Now go back and check your solutions .... have you set your workings out as clearly as you should?

Check your name is on your work. Staple all pieces of paper you have worked on together in order. Bring this work to your first Further Maths lesson in September.