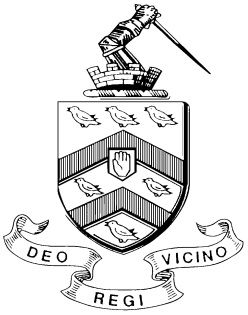
BROMSGROVE SCHOOL



ENTRANCE EXAMINATION PAPERS

YEAR 12 ENTRY

MATHEMATICS

TIME ALLOWED – 60 MINUTES

Students Name: _____

Date Test Taken: _____

Students Date of Birth: _____

Instructions:

Answer as many questions as you can in the spaces provided. Do not worry if you do not finish. You should have a calculator; its use is expected. Show your working clearly as credit will be given for this in the event of an incorrect answer.

1 Work out the value of $5x - x^2$ when $x = -4$

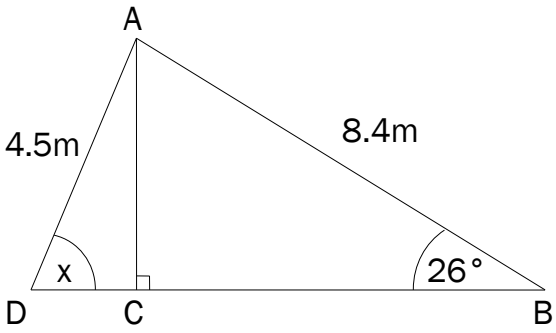
2 If $a = \frac{3}{4}$ and $b = 1\frac{2}{3}$, find the value of $\frac{1}{a} + \frac{1}{b}$

3 Solve $\frac{11 + 2x}{4} = 3x + 4$

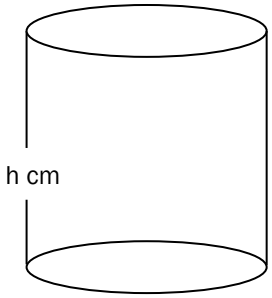
4 Expand and simplify $(4 + 3\sqrt{2})(2 - \sqrt{2})$

5 a) Find the length of AC.

b) Find the size of angle x



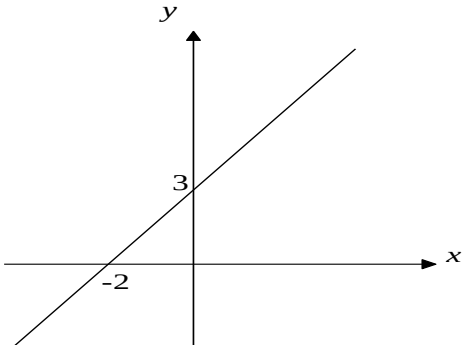
6 a) Rearrange $A = 2\pi r(r + h)$ to make *h* the subject.



b) The surface area of the cylinder is 392 cm^2. Find its height if the base's radius is 4cm.

7 Point P has coordinates (7 ,6) and point Q has coordinates (2 , –2). Find the length of PQ, giving your answer to two decimal places.

8 The diagram shows a straight-line on a graph.
Write down its equation.



9 Bag A contains five red and three green balls. Bag B contains one red and three green balls. A ball is randomly selected from each bag.

a) What is the probability that both balls are red?

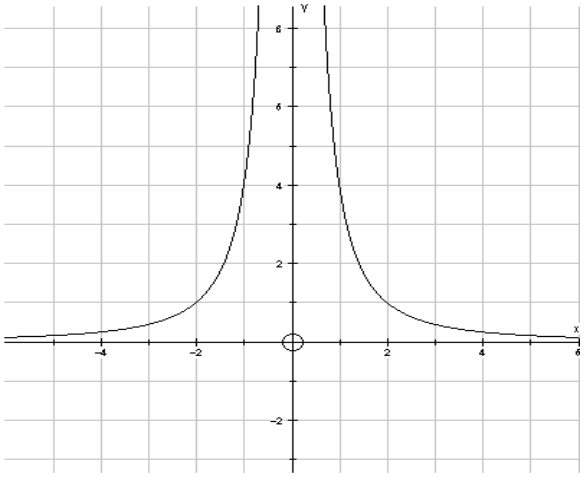
b) What is the probability that the balls are different colours?

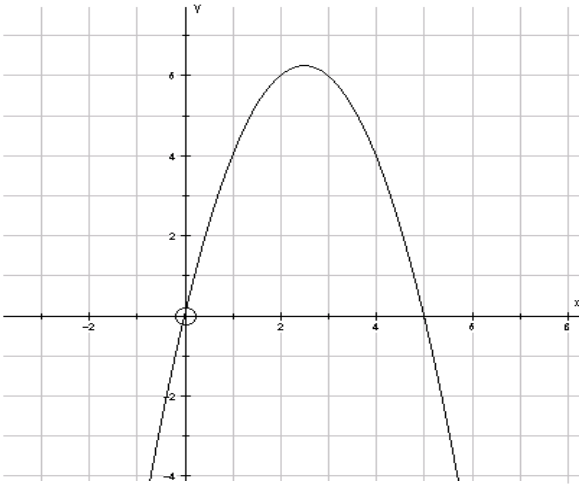
c) A single ball is drawn from a randomly picked bag. What is the probability it is red?

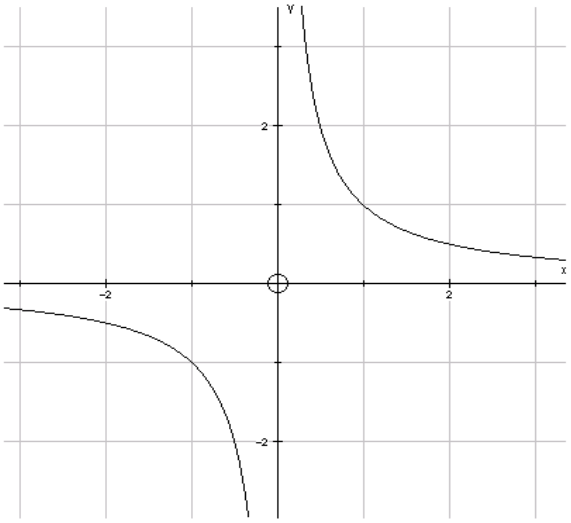
10 The diagrams show the graphs of the functions

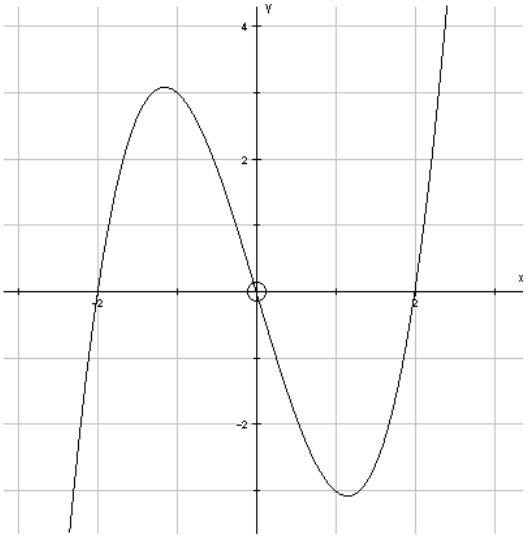
$$y = 5x - x^2 \qquad y = x^3 - 4x \qquad y = \frac{1}{x} \qquad y = \frac{4}{x^2}$$

Label each graph with its equation.









11 A function f is defined by $f(x) = 2x - 5$

a) What is $f(3)$? _____

b) If $f(x) = 16$ what is x ? _____

12 Expand and simplify:

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

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

c) Factorise $12m^2n+8mn^2$

d) Factorise $x^2-5x-24$

e) Hence solve the quadratic equation $x^2-5x-24=0$

13 Simplify the algebraic fraction $\dfrac{3}{4x+1}+\dfrac{2}{2x-3}$

14 Solve the equation $4x^2+5x-8=0$, giving your solution correct to two decimal places.

15 a) Write x^2-8x+5 in the form $(x+a)^2+b$

b) State the minimum value of x^2-8x+5 and the value of x when this occurs.

16 a) Write with a single index:

i) $x^8 \div x^{-2}$

ii) $3a^3 \times 4a^2$

iii) $(\sqrt{x})^6$

b) Write as fractions:

i) $16^{-\frac{1}{2}}$

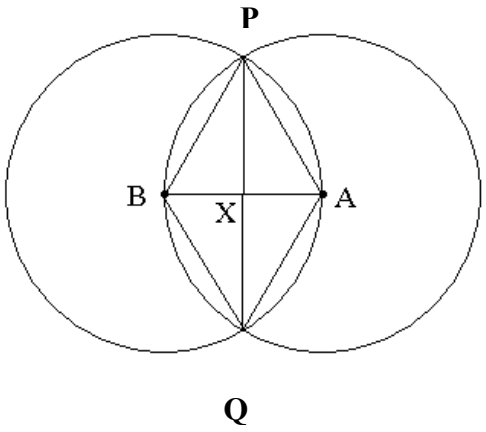
ii) $\left(\frac{8}{27}\right)^{\frac{2}{3}}$

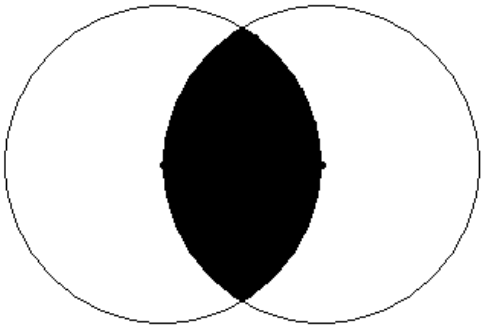
17 Solve the simultaneous equations $y = 3x - 1$ and $x^2 + y^2 = 5$

18 Make x the subject of the equation $y = \dfrac{2x^2 - 5}{3x^2 - 4}$

19 Fully simplify $\dfrac{x^2 - 36}{x^2 + 6x}$

20 The first diagram shows two circles each of radius 5 centimetres, one centred at A and the other at B.





a) State the size of angles PAB and PAQ.

b) Calculate the distance PX giving your answer correct to 3 sig. figs.

c) Calculate the area of the triangle PAB giving your answer correct to 3 sig. figs.

d) Calculate the area of the sector PAB

e) Hence calculate the area shaded in the second diagram.

21 A tetrahedron is a solid with four faces. Each face is an equilateral triangle. Each edge of the tetrahedron ABCD has length 1. The face ABC is horizontal, and P is the point on ABC which is vertically below D.

a) Calculate the length of PD

b) Find the cosine of the angle between two adjacent faces of the tetrahedron.