WOODHOUSE GROVE SCHOOL

ENTRANCE
EXAMINATION

16 + mathematics

Surname :   _____

Known name(s):   _____

1 hour

Read the following instructions carefully before starting the examination

The use of calculators is expected

Take care with units

Show your working in the spaces provided

1   (a) Expand and Simplify

$$7(2x + 3) - 4(4x - 8)$$

(2 marks)

(b) Expand and simplify

$$(x + 8)(2x - 3)$$

(2 marks)

(c) Factorise completely

$$27a^2 - 12b^2$$

(2 marks)

(d) Solve

$$x^2 - 8x + 15 = 0$$

(3 marks)

2.   The price of a new car is £17 400
        This price includes Value Added Tax (VAT) at 20%
        (a)   Work out the cost of the car **before** VAT was added

(3 marks)

The value of the care depreciates each year by 15%. This means that at the end of each year the value of the car has gone down by 15% of its value at the start of that year.

(b)   The value of the car was £17 400 at the start of the first year. Work out the value of the car at the end of the fourth year. Give you answer to the nearest penny.

(4 marks)

3.   (a) Factorise
        $x^2 + 4x - 12$

(1 mark)

(b) Write as a single fraction in its simplest form.

$$\frac{4x}{x^2 + 4x - 12} - \frac{1}{x - 2}$$

(4 marks)
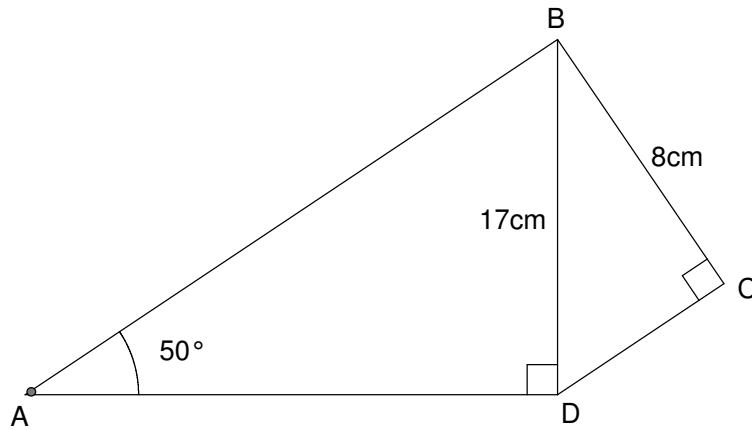
4.   Solve the simultaneous equations

        $2x + 3y = -15$
        $6x - y = 25$

(4 marks)

5

Diagram NOT accurately drawn

ABCD is a quadrilateral
Angle BDA = 90°, Angle BCD = 90°, angle BAD = 50°.
BC = 8cm, BD = 17cm

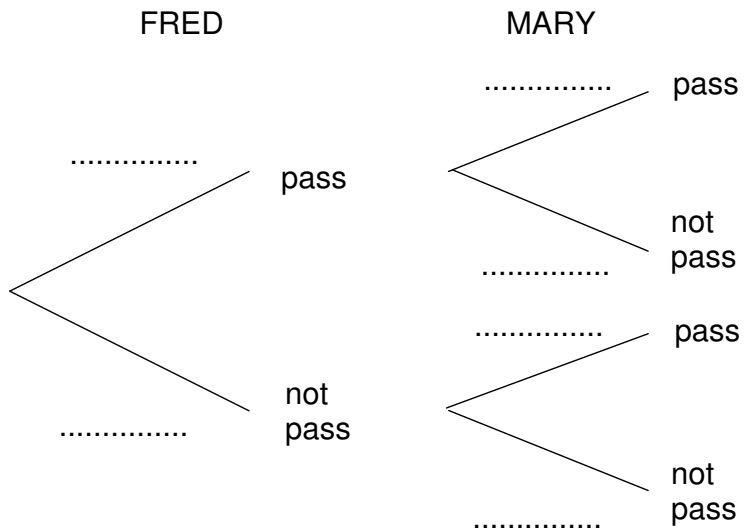(a)   Calculate the length of DC

(3 marks)

(b)   Calculate the size of angle DBC
        Give your answer correct to 1 decimal place.

(3 marks)

(c)   Calculate the length of AB. Give your answer correct to 3 significant
        figures.

(3 marks)

6. Fred and Mary are going to take a driving test.
The probability that Fred will pass the driving test is 0.9
The probability that Mary will pass the driving test is 0.85
The two events are independent.

FRED   MARY

.... pass

.... pass

                                        not
                                        pass
                        ....

                        .... pass

           not
           pass
....

                                        not
                                        pass
                        ....

(a)   Complete the probability tree diagram

(2 marks)

(b)   Work out the probability that both Fred and Mary will fail the driving
       test.

(2 marks)

(c)   Work out the probability that one of them will pass the driving test
       and the other one will not pass.

(3 marks)

7. Find the solutions of the equation
$$2x^2 - 5x - 2 = 0$$
Give your solutions in surd form, and then correct to 3 decimal places

(4 marks)

8. Make v the subject of the formula
$$q = 4\left(\frac{v^2}{9} - 11\right)$$

(4 marks)

9. y is inversely proportional to x^3.
   y = 2 when x = 3

   (a) Write y in terms of x

(3 marks)

   (b) Calculate the value of y when x = 2. Leave your answer as a fraction.

(2 marks)
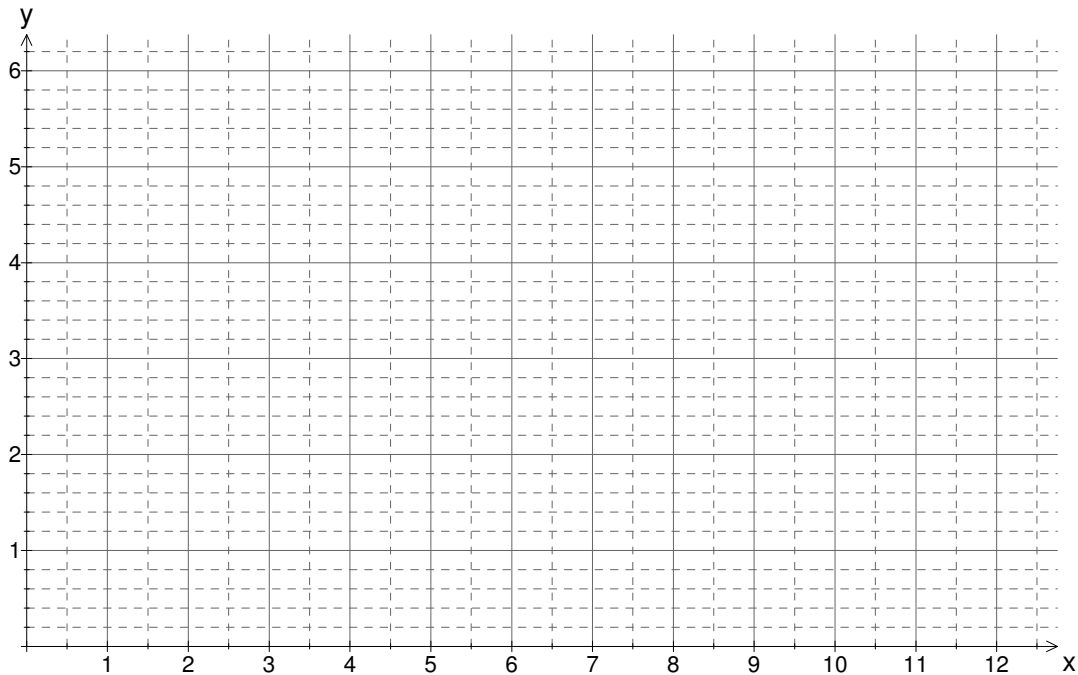
10.   A ball on an elastic string moves vertically so that its distance below a fixed point in given by the formula

$$y = 3 + 2\cos(15x)°$$

where x is the time in seconds.

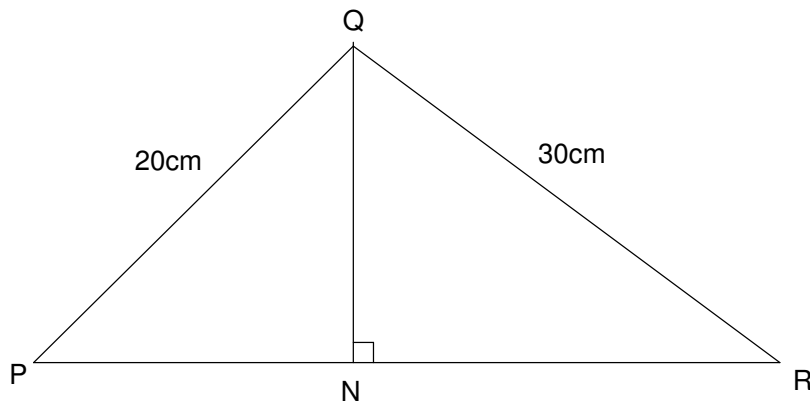(a)   On the axes below, draw a graph of y against t for $0 \le x \le 12$.

(3 marks)

(b)   Find the two values of x, where $0 \le x \le 48$, when the distance below the fixed point is least.

(3 marks)

11.

Angle PQR = 150°
QN is perpendicular to PR
QR = 30cm
Calculate PR and QN
Give your final answers to 3 significant figures.

(10 marks)