

Surname	Centre Number	Candidate Number
Other Names		0



GCSE LINKED PAIR PILOT

4363/02

METHODS IN MATHEMATICS UNIT 1: Methods (Non-Calculator) HIGHER TIER

A.M. TUESDAY, 11 June 2013

2 hours

**CALCULATORS ARE
NOT TO BE USED
FOR THIS PAPER**

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3.14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

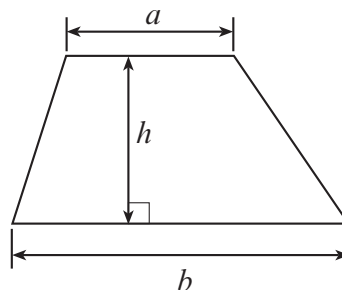
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question 8.

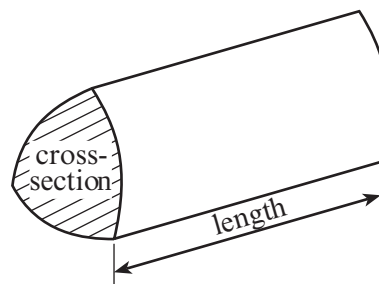
For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	3	
2	4	
3	4	
4	7	
5	4	
6	4	
7	4	
8	7	
9	3	
10	5	
11	10	
12	6	
13	3	
14	6	
15	5	
16	6	
17	8	
18	11	
TOTAL MARK		

Formula List

Area of trapezium $= \frac{1}{2} (a + b)h$

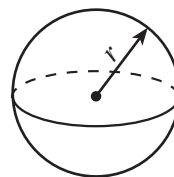


Volume of prism $= \text{area of cross-section} \times \text{length}$



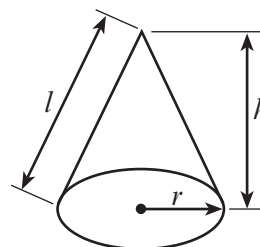
Volume of sphere $= \frac{4}{3} \pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3} \pi r^2 h$

Curved surface area of cone $= \pi r l$

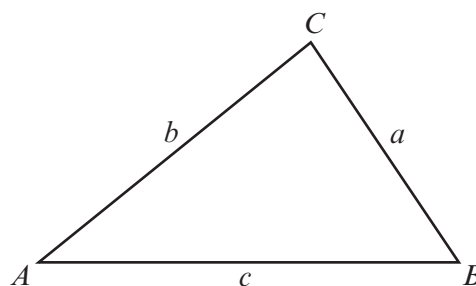


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle $= \frac{1}{2} ab \sin C$



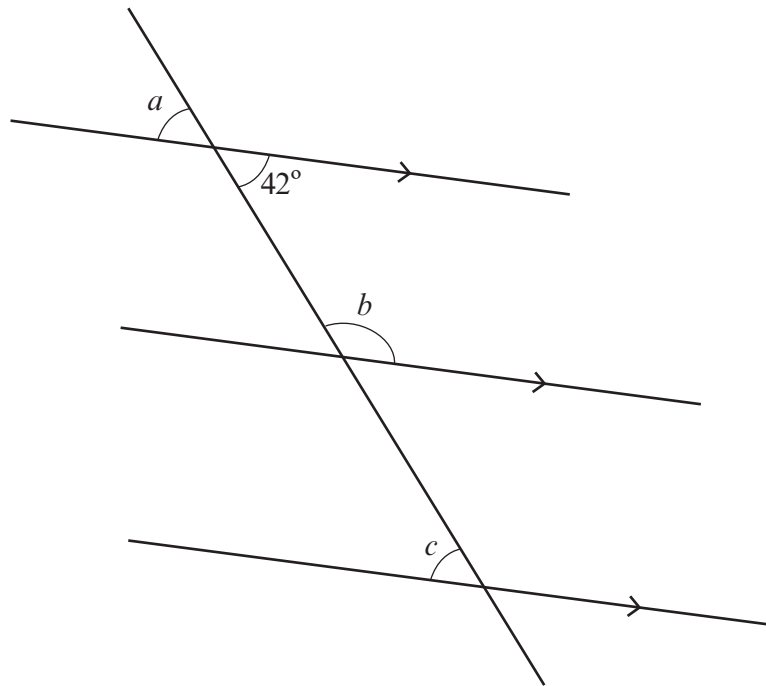
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1.

*Diagram not drawn to scale*Find the size of each of the angles a , b and c .

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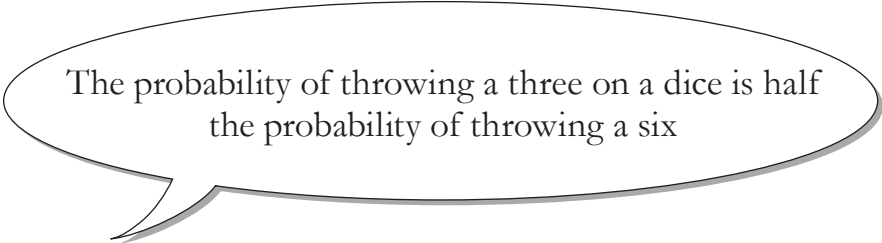
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 $a = \text{.....}^\circ$ $b = \text{.....}^\circ$ $c = \text{.....}^\circ$

[3]

2. Nancy makes two statements about the probability of events based on throwing fair dice. For each of her statements below, decide if Nancy is correct or not. You must explain your decisions **using probabilities**.



The probability of throwing a three on a dice is half the probability of throwing a six

Is Nancy correct?

Explanation:

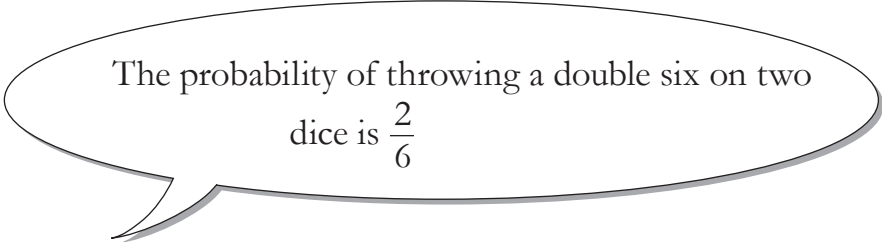
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The probability of throwing a double six on two dice is $\frac{2}{6}$

Is Nancy correct?

Explanation:

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3. Given the following information, complete the Venn diagram shown below.

- $\epsilon = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
- **A** is the set of factors of 24
- **B** is the set of multiples of 3
- **C** is the set of common factors of 30 and 70

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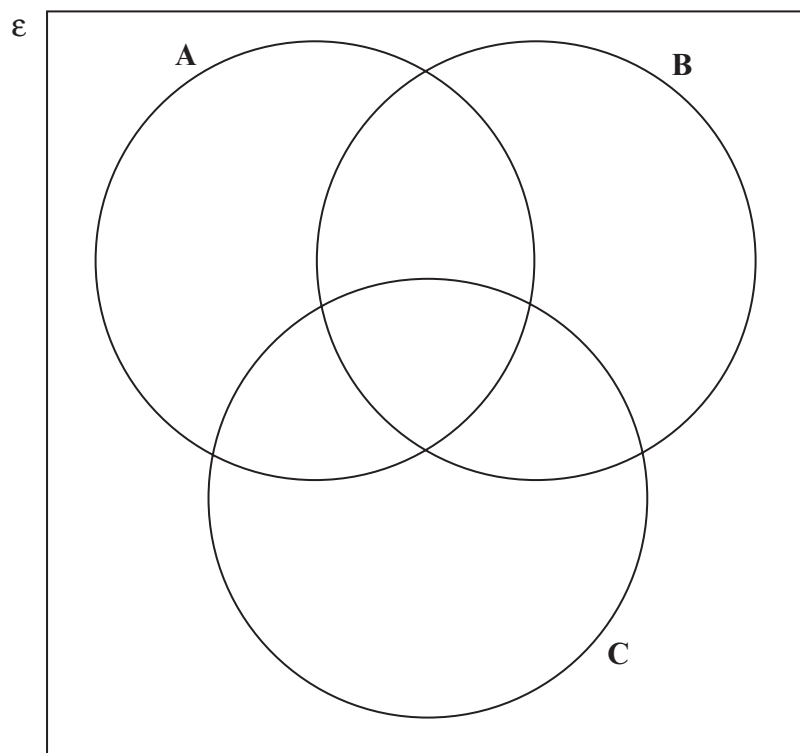
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4. (a) You are given the coordinates of three of the four vertices of a parallelogram.

They are $(3, 2)$ $(5, -2)$ $(7, 2)$.

Find the coordinates of two possible positions for the fourth vertex.

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Coordinates of one of the possible answers $(\dots\dots\dots, \dots\dots\dots)$

Coordinates of another possible answer $(\dots\dots\dots, \dots\dots\dots)$

[4]

(b) Complete the table below.

Name of quadrilateral	Number of lines of symmetry	Are both diagonals perpendicular to each other? Yes or No	Are both pairs of opposite angles always equal? Yes or No
Kite			
Isosceles trapezium			
.....	2	Yes	Yes

[3]

5. Complete the following table.

Fraction	Decimal	Recurring decimal? Yes or No	Terminating decimal? Yes or No
$\frac{2}{5}$			
$\frac{5}{8}$			
$\frac{7}{9}$			
$\frac{2}{11}$			

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6. Three farmers shared an order for fertiliser between them in the ratio 3:4:7.
Jade got the largest share.
Bethan got the smallest share.
Noah's share was 60 kg.
Calculate how much of the fertiliser Jade and Bethan each received.

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Jade kg

Bethan kg

[4]

7. Ali has a number of tiles.

He has some squares tiles and some tiles in the shape of equilateral triangles.

The edges of all the tiles are of equal length.

He uses some tiles of each shape to make an example of a tessellation.

- Sketch how Ali can use square tiles **and** tiles in the shape of equilateral triangles to make an example of a tessellation.
- Explain, using your knowledge of angle facts, why this is an example of a tessellation. You must include at least one tile of each shape and show all your calculations.

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- Three of the exterior angles of a pentagon are 105° , 115° and 80° . The other two exterior angles are equal. Calculate the size of each of the **interior** angles of the pentagon. You must show all your working.

9. Jack makes the following statements.

- 36 and 60 are both common factors of 180.
- The highest common factor of 36 and 60 is **not** a factor of 180.

Decide whether each of Jack's statements is correct.
You must show your working and give a reason for your answer.

[3]

10. (a) Use the grid below to draw graphs to represent each of the following equations.

(i) $y = \frac{1}{2}x + 6$

(ii) $x + y = 8$

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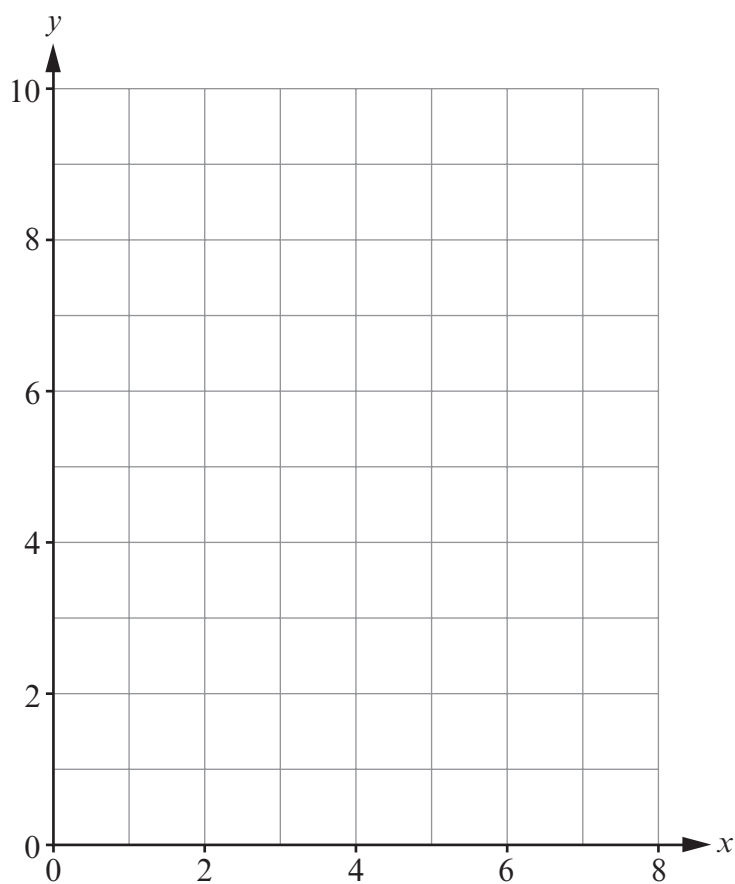
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Label your lines (i) and (ii) as appropriate.



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- (b) Using your answer to (a), are the lines $y = \frac{1}{2}x + 6$ and $x + y = 8$ perpendicular to each other?
Give a reason for your answer.

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11. (a) Rearrange the following to make t the subject of the formula

$$3(t - g) = h(f - t).$$

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- (b) Find the n th term of the following sequences.

(i) 3, 13, 23, 33, 43, ...

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(ii) 50, 40, 30, 20, 10, ...

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(iii) 8, 14, 24, 38, ...

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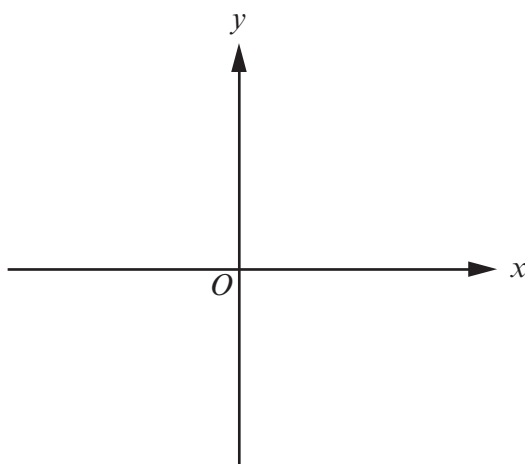
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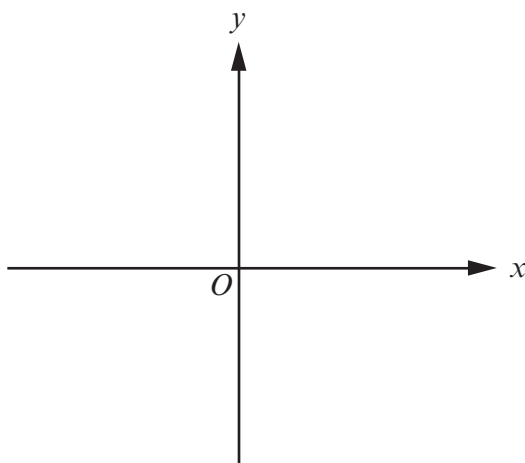
12. (a) Use the axes provided to sketch the graphs of the following.

(i) $y = x^3$



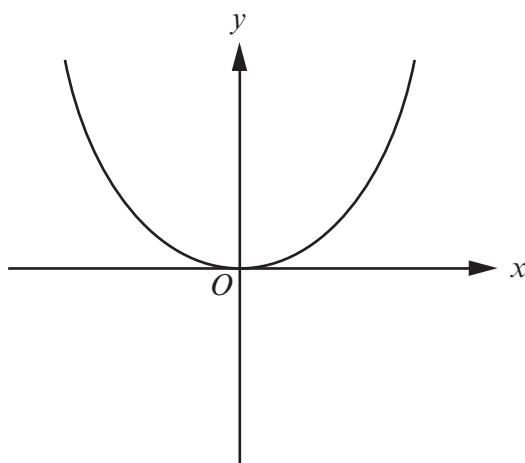
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(ii) $y = \frac{1}{x}$



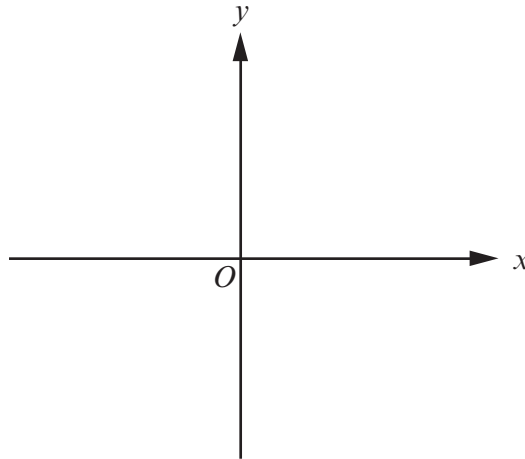
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(b) The sketch below shows $y = x^2$



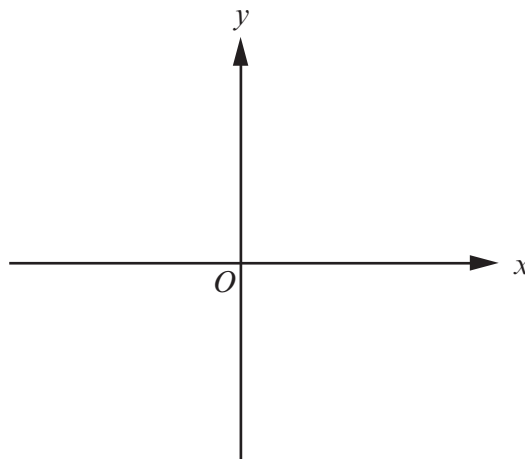
Use the axes provided to sketch the graphs of the following.
Give coordinates of any points where the graphs intersect the y -axis.

(i) $y = -x^2$



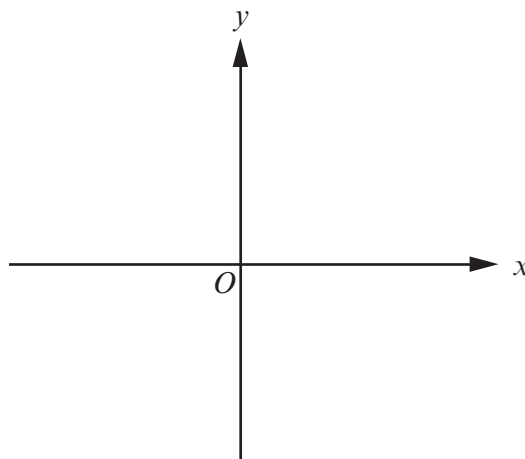
[1]

(ii) $y = x^2 + 3$



[2]

(iii) $y = 8x^2$



[1]

13. Show that $(2x + 7)(x - 4) + x(x + 1) + 4 \equiv 3(x^2 - 8)$.

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14. Evaluate the following, giving your answer in standard form.

(a) $\frac{6.3 \times 10^{12}}{12.6 \times 10^8}$

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(b) $(8 \times 10^2) \times (3 \times 10^6)$

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(c) $(3.24 \times 10^8) + (1.2 \times 10^7)$

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15. (a) Evaluate $6\sqrt{5} \times 2\sqrt{5}$.

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(b) Evaluate $(7\sqrt{2} - 4\sqrt{2})^4$.

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16. (a) In the diagram below $RX = a$, $XT = b$, $XS = c$ and $UX = d$.

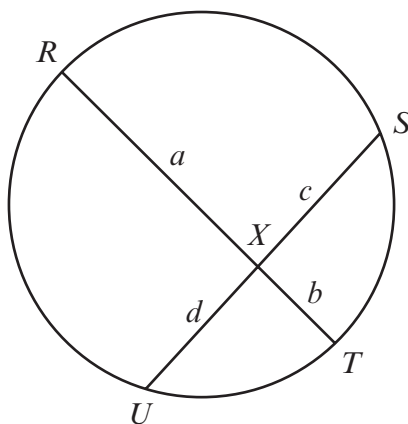


Diagram not drawn to scale

Write an expression for b in terms of a , c and d .

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(b) In the diagram below:

- Point O is the centre of the circle
- Points A , B , C and D lie on the circumference of the circle
- RAP is a tangent to the circle
- $\widehat{ACD} = x$

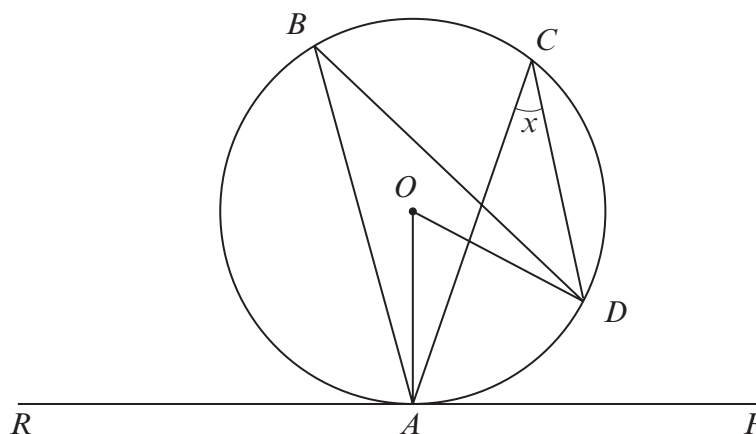


Diagram not drawn to scale

(i) Write down the size of $\widehat{OAP}$, giving a reason for your answer.

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(ii) Complete the following statements in terms of x .

$$\widehat{DOA} = \dots\dots\dots$$

$$\widehat{DBA} = \dots\dots\dots$$

[2]

17. As part of a competition twenty tickets are placed in a hat.
The tickets are numbered from 1 to 20.
Anna is going to pick out two tickets.

(a) If the rule for winning a prize is

'numbers that are multiples of six win a prize',

calculate the probability that Anna picks out two winning tickets.

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(b) If the rule for winning a prize is

'numbers that are factors of eighteen win a prize',

calculate the probability that Anna picks out at least one winning ticket.

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18. (a) Simplify $\frac{x^2 - 81}{2x^2 + 13x - 45}$.

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- (b) (i) Express $x^2 + 12x + 14$ in the form $(x + a)^2 + b$, where a and b are whole numbers to be found.

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- (ii) Hence solve $x^2 + 12x + 14 = 0$ leaving your answer in surd form.

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