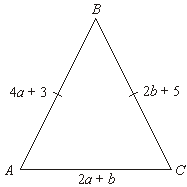
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| --- | --- | --- | --- |
|  | | | |
| Simultaneous Equations  Markscheme at back | | | Name:  Class: |
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**Q1.**          *ABC* is an isosceles triangle.  
The lengths, in  cm, of the sides are

*AB =* 4*a* + 3, *BC =* 2*b* +5and *AC* = 2*a* + *b*

**            Not to scale

(a)     *AB = BC*

          Show that     2*a – b =* 1

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**(2)**

(b)     The perimeter of the triangle is 32 cm. Find the values of *a* and *b.*

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Answer *a =* ..................... cm, *b =*....................... cm

**(4)**

**(Total 6 marks)**

**Q2.**          Solve these simultaneous equations

*x* + 3.6*y =* 2  
*x* – 2.4*y =* 5

          You **must** show all your working.  
Do **not** use trial and improvement.

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Answer *x =* ..............................................

*y* = ..............................................

**(Total 3 marks)**

**Q3.**          Solve the simultaneous equations          4*x* + 3*y* = 14           2*x* + *y* = 5

          You **must** show your working.  
Do **not** use trial and improvement.

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Answer *x* = .................... , *y* = ......................

**(Total 3 marks)**

**Q4.**          Two gas supply companies have different ways of charging for the gas they supply.

|  |  |
| --- | --- |
|  | **Alpha gasCO**  Fixed Charge                                  £9.60 Price per kilowatt hour of gas        First 5 kilowatt hours free then                                                         £1.30 for every kilowatt hour over 5. |

|  |  |
| --- | --- |
|  | **Beta gasCO**  Fixed Charge                                  No fixed charge Price per kilowatt hour of gas        £1.50 for every kilowatt hour. |

          Find the number of kilowatt hours after which Alpha gasCo becomes cheaper than Beta gasCo.

          You might want to use some graph paper.

          You **must** show your method clearly.

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Answer ................................... kilowatt hours

**(Total 4 marks)**

**Q5.**          (a)     Factorise 7*x* + 14

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Answer .................................................

**(1)**

(b)     Expand and simplify 4(*m* + 3) + 3(2*m* – 5)

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Answer .................................................

**(2)**

(c)     Solve the simultaneous equations:

2*x* + 3*y* = 9  
3*x* + 2*y* = 1

          You **must** show all your working.  
Do **not** use trial and improvement.

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Answer *x* = ......................., *y* = .........................

**(4)**

(d)     Factorise *x*2 + 6*x* – 16

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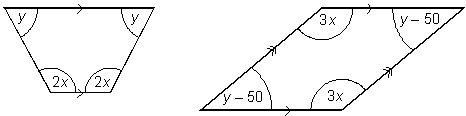
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Answer .................................................

**(2)**

**(Total 9 marks)**

**Q6.**          The diagrams show a trapezium and a parallelogram.



Not drawn accurately

(a)     Use the trapezium to explain why         2*x* + *y* = 180

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**(1)**

(b)     The parallelogram can be used to form another equation connecting *x* and *y*.

          Tick a box to show the correct equation.

     3*x* + *y* = 130                                  3*x* + *y* = 230

     3*x* = *y* – 50                                    3*x* + *y* = 410

**(1)**

(c)     Hence, or otherwise, work out the values of *x* and *y*.

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Answer *x* = ................ , *y* = …...............

**(3)**

**(Total 5 marks)**

**Q7.**          Solve the simultaneous equations

*x* + 3*y* = 11

2*x* – *y* = 1

          You **must** show your working.

         Do **not** use trial and improvement.

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Answer *x* = ............. , *y* = ...............

**(Total 3 marks)**

**Q8.**                         



          Work out the values of *a* and *b*.

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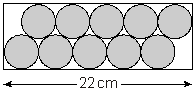
Answer *a* = ..................., *b* = ..................

**(Total 3 marks)**

**Q9.**          Four identical circular discs fit into a rectangle 10 cm long.

          Not drawn accurately

          Ten of the same discs fit into a rectangle 22 cm long.

       Not drawn accurately

          24 discs are placed together in the same way.

          How long is the rectangle?

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Answer ..............................................cm

**(Total 3 marks)**

**Q10.**          The rule for continuing a Fibonacci sequence is to add the last two terms to make the next term.

          For example, the sequence that starts 1, 1, … continues as 1, 1, 2, 3, 5, 8, …

          Two other Fibonacci sequences start *a*, 2*a*, …… and *b*, 4*b*, …

          The fifth terms of these two sequences are equal.

          Given that *a* + *b* = 11, work out the values of *a* and *b*.

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Answer *a* = ...................... *b* = .......................

**(Total 4 marks)**

**Q11.**          Solve the simultaneous equations

2*x* + 5*y* = 16

4*x* + 3*y* = 11

          You **must** show your working.

Do **not** use trial and improvement.

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Answer .......................................................................

**(Total 3 marks)**

**Q12.**          Two families go to a pantomime.

          The Khan family of two adults and three children pay £69.

          The Lewis family of three adults and five children pay £109.

          Work out the cost of an adult ticket and the cost of a child ticket.

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Answer               Adult ticket £ ..........................          Child ticket £ ..........................

**(Total 5 marks)**

**MARK SCHEME**

**M1.**          (a)     4*a* + 3 = 2*b* + 5

**M1**

(b)     4*a* – 2*b* = 2 (-2)

*Must indicate division by 2*

**A1**

4*a*+3+2*b*+5+2*a*+*b*=32

6*a* + 3*b* = 24

2*a* + *b* = 8

*Bl for any version*

**M1**

(1) × 3: 6*a* – 3*b* = 3

**M1**

12*a* = 27

*For attempt to eliminate*

*AB or 4a + 3 =12 and BC or 2b + 5 = 12*

**M1**

*a* = 2.25

**A1**

**[6]**

**M2.**          trial and improvement is 0

          1st-2nd

*6y = – 3 allow 1 error  eg, 12y = – 3 6y = 3  
2 – 3.6y = 5 + 2.4y allow 1 error or  
2.4equation(l) + 3.6equation(2)*

**M1**

*y* = – 0.5 or *x* = 3.8

**A1**

*y* = – 0.5 and *x* = 3.8

*Must have both.*

*Allow reversed if both seen correct in working*

*ft if Ml awarded*

**A1 ft**

**[3]**

**M3.**          4*x* + 3*y* = 14     4*x* + 3*y* = 14  
4*x* + 2*y* = 10     6*x* + 3*y* = 15

*allow error in one term*

**M1**

*y = 4           2x = 1*

*correct elimination from their equations*

**M1**

*x* =  **and** *y* = 4

*oe  
SC correct answers with no working or using T & I*

**A1**

**[3]**

**M4.**          9.60 + (*x* – 5) × 1.30

*Alt: M1 for graph of Alpha parcels*

**M1**

          = 1.50*x*

*M1 for graph of Beta*

**M1**

          3.10 = 0.20*x*

*A1 accuracy*

**A1**

*x* = 15.5

*A1 answer. Accept 16 but not 15.  
T&I gets M1 iff taken as far as 15.  
A1 for both schemes at 15  
A1 for both schemes at 16  
A1 conclusion*

**A1**

**[4]**

**M5.**          (a)     7(*x* + 2)

*allow one error*

**B1**

(b)     4*m* + 12 + 6*m* – 15

**M1**

10*m* – 3

*allow 10m + –3*

**A1**

(c)     6*x* + 9*y* = 27          4*x* + 6*y* = 18  
     and           or         and

6*x* + 4*y* = 2            9*x* + 6*y* = 3

**M1**

5*y* = 25          or      5*x* = –15

**M1 dep**

*y* = 5              or      *x* = – 3

**A1**

*x* = – 3          and     *y* = 5

**A1**

*SC1 correct answer with no working or using T&I*

(d)     (*x* + 8)(*x* – 2)

*B1 (x ± 8)(x ± 2)*

**B2**

**[9]**

**M6.**          (a)     Valid explanation

*eg    allied angles (add up to 180)  
       inside parallel lines (add up to 180)  
       y + y + 2x + 2x = 360 so y + 2x = 180  
       2y + 4x = 360  
       In a C add up to 180*

*Condone interior angles (add up to 180)*

**B1**

(b)     3*x* + *y* = 230

*oe*

**B1**

(c)     Attempt to eliminate a variable  
(with 2*x* + *y* = 180)

*eg    6x + 2y = 460 and 6x + 3y = 540 and subtraction*

*Note: Full marks can be awarded for this part on  
          follow through*

**M1**

*x* = 50

**A1 ft**

*y* = 80

**A1 ft**

*3x + y = 130 → x = –50, y = 280*

*3x = y –50 → x = 26, y = 128*

*3x + y = 410 → x = 230, y = –280*

**[4]**

**M7.**          2*x* + 6*y* = 22

*6x – 3y = 3*

**M1**

          7*y* = 21

*7x = 14*

**A1**

*y* = 3 and *x* = 2

**A1**

**[3]**

**M8.**          *a* + *b* = 7

**M1**

*ab* = 10

**M1**

*a*  = 2, *b* = 5

*a = 5, b = 2*

**B1**

**[3]**

**M9.**         Evidence of searching for a pattern  
or *r* = 2 or *d* = 4  
**or** 6 extra discs gives extra 12 cm

*eg,   4 → 10, 10 → 22 or  
       5 → 10, 11 → 22 or markings on  
       diagram or diagram of 24 discs (2 rows)*

*6 extra discs gives extra 12 cm*

**M1**

2*n* + 2 or 2(*n* + )

**or** 14 extra discs gives 28 cm  
**or** 20 extra discs gives 40 cm

*12d + r or 25r*

*22 + 28*

*10 + 40*

**M1**

          50

**A1**

**[3]**

**M10.**          8*a*

*8a = 14b or 4a = 7b M1*

**B1**

          14*b*

*4a + 4b = 44 or 7a + 7b = 77 M1*

**B1**

*a* = 7 answers only with no working is zero marks

*11b = 44 or 11a = 77 A1*

**B1**

*b* = 4 allow answers reversed

*a = 7 and b = 4 A1*

**B1**

**[4]**

**M11.**          4*x* + 10*y* = 32      6*x* + 15*y* = 48

          (4*x* + 3*y* = 11)      20*x* + 15*y* = 55

*oe*

*Allow one error*

**M1**

          7*y* = 21 or 14*x* = 7

*oe*

**A1 ft**

*y* = 3 and *x* = 

*SC1 for no working or T&I*

**A1**

**[3]**

**M12.**          2*a* + 3*c* = 69  
3*a* + 5*c* = 109

*B1 one equation correct*

*Any letters may be used but need to be consistent for B2*

**B2**

          × 1st by 3 or 5  
× 2nd by 2 or 3

*oe (to obtain consistent coefficients)*

**M1**

          Two equations (max one error) and subtraction

*eg,   6a + 9c = 207*

*6a + 10c = 218 and subtraction*

**M1 dep**

          Adult (*a* =) 18 Child (*c* =) 11

**A1**

**[5]**