Answer **all** the questions.

1 **(a)** Find the prime factorisation of 360, expressing the answer in index notation.

Answer (a) 360 =..... [1]

(b) Hence, find the smallest integer n, such that $\sqrt[3]{360 \times n}$ is an integer.

Answer (b) n =..... [2]

2 Consider the numbers below.

$$-1.24, \frac{1}{\sqrt{2}}, -\sqrt[3]{5}, \frac{1}{3}$$

Write down

(a) the irrational numbers,

Answer (a) ..... [1]

(b) the rational numbers.

Answer (b) ..... [1]

Name: _____ ( ) Class: _____

3 By showing your working clearly, evaluate each of the following, expressing each answer in its simplest form.

(a) $5-\{12\times[(-7)^2-7]\div 4\}$

Answer (a) ..... [3]

(b) $-1+\left[\frac{1}{2}+\left(-\frac{1}{3}\right)\right]+\left(-\frac{1}{30}\right)$

Answer (b) ..... [3]

4 Express

(a) 30 185 to 4 significant figures,

Answer (a) ..... [1]

(b) 743.253 to 2 decimal places.

Answer (b) ..... [1]

5 The figure below is a model of a pencil and an eraser. Using the given length of the eraser, estimate the length of the pencil.

Answer ..... cm [1]

6 Without using a calculator, estimate, correct to 1 significant figure, the value of

$$\frac{\sqrt{2486}-41.2}{7.99\times 10.11}.$$

Answer ..... [2]

7 Lydia wants to buy a rectangular table cloth for her dining table. The area of the table cloth is 2.35 m^2 and the breadth is 1.05 m.

(a) Find the length of the table cloth, correct to 2 decimal places.

Answer (a) ..... m [1]

(b) Using your answer in part (a), find the perimeter of the table cloth.

Answer (b) ..... m [1]

8 In a classroom, each female student has 2 pens while each male student has 3 pens. Find the total number of pens if there are q number of female students and r number of male students in the class.

Answer .....pens [1]

9 Simplify the following.

(a) $(-3v + z) - (5v - 2z)$

Answer (a) ..... [2]

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

Answer (b) ..... [2]

(c) $\frac{2h}{7} + \frac{3h + 2}{5}$

Answer (c) ..... [3]

10 James has 3 boxes of clips. The first box contains $(6x-1)$ orange clips, the second box contains $(x+1)$ green clips and the third box contains $(2x+5)$ yellow clips.

(a) Find, in terms of x, the total number of clips in the boxes.

Answer (a) ..... clips [3]

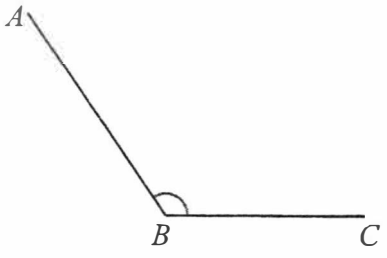
(b) If there are 59 clips in total, find the value of x.

Answer (b) $x =$..... [3]

11 Solve the equation $2(2x-3)-3(x+4)=0$

Answer $x =$..... [3]

12 Lydia states that angle ABC is an acute angle. However, her teacher said that her answer is wrong. State the correct answer and explain why she is wrong.



Answer ..... [2]

.....

.....

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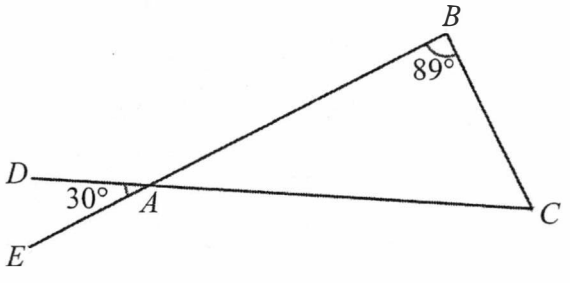
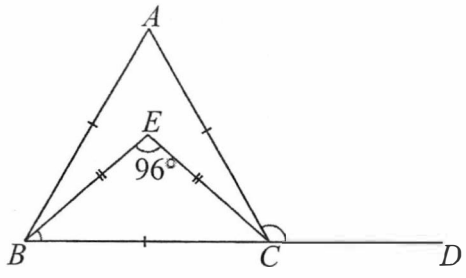
13 In the diagram below, BE and CD are straight lines. Given that $\angle DAE = 30°$ and $\angle ABC = 89°$, giving reasons for your answer, find $\angle BCA$.



Answer $\angle BCA$ =..... [2]

14 In the diagram below, BCD is a straight line. It is given that $\angle BEC = 96°$, $AB = BC = AC$ and $EB = EC$.



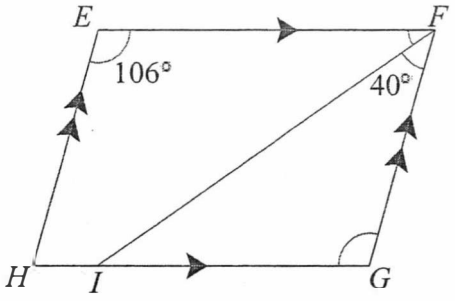
(a) Find $\angle EBC$, giving reasons for your answer.

Answer (a) $\angle EBC =$ ..... [1]

(b) Find $\angle ACD$, giving reasons for your answer.

Answer (b) $\angle ACD =$ ..... [2]

15 In the diagram below, $EFGH$ is a parallelogram. It is given that $\angle FEH = 106°$ and $\angle IFG = 40°$.



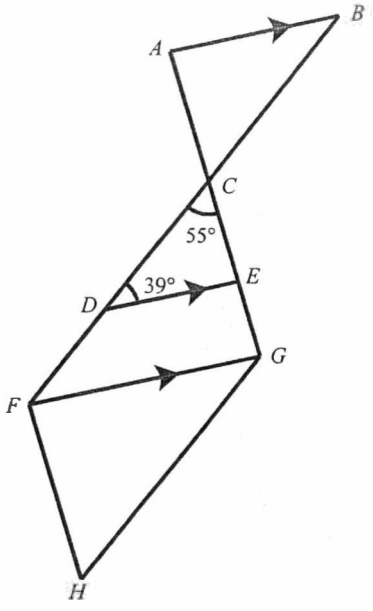
(a) Find $\angle FGH$, giving reasons for your answer.

Answer (a) $\angle FGH =$ ..... [1]

(b) Find $\angle EFI$, giving reasons for your answer.

Answer (b) $\angle EFI =$ ..... [1]

16 In the diagram below, *AB, DE* and *FG* are parallel lines. *FB* and *AG* are straight lines. It is given that $\angle EDC = 39°$ and $\angle DCE = 55°$.



(a) Find $\angle CGF$, giving reasons for your answer.

Answer (a) $\angle CGF =$ ..... [2]

(b) Find the reflex $\angle ABC$, giving reasons for your answer.

Answer (b) $\angle ABC =$ ..... [2]

(c) Given that $\angle CFH = 125°$, **state** and **explain** the relationship between *CG* and *FH*.

Answer (c) .....

.....

.....

..... [2]

1 Three lighthouses flash their lights every 15, 20 and 27 seconds respectively. Peter noticed that all three lighthouses flashed their light together at 12 midnight.

(a) When will all three lighthouses next flash their light together? [3]

(b) How many times would all three lighthouses flash their light together between midnight and 1 am? [1]

---

2 Evaluate the following with the help of a calculator, giving your answer correct to 5 significant figures.

(a) $\dfrac{\pi(7.24^2 - 5.83^2) \times 0.25}{\sqrt{0.028}}$ [1]

(b) $\sqrt[3]{\dfrac{(3.29)^2}{(5.41)^3 - \sqrt{6.321}}} + \dfrac{\frac{3}{8} + \left(\frac{4}{5}\right)^2}{\frac{3}{5}}$ [1]

---

3 **(a)** Simplify the following.

(i) $4(2x + y) - 3(5x - 6y)$ [2]

(ii) $1 + \dfrac{3(2x + 3)}{2} - \dfrac{4x - 2}{3}$ [2]

(b) An examination consists of three papers. The minimum total score to pass the examination is $(9x + 5y)$ marks. Ali scored $(3x - 2y + 10)$ marks and $(3x + 4y - 7)$ marks in the first two papers.

(i) Find Ali's total score in the first two papers. [1]

(ii) How many marks did Ali score in the third paper if he just passed the examinations? [2]

(iii) Find the average score of the three papers. [1]

---

4 **(a)** Factorise each of the following completely.

(i) $18ab + 6a - 36az$ [1]

(ii) $4c(x - 2y) + 3b(x - 2y)$ [1]

(b) Evaluate $54321 \times 36 - 54321 \times 26$ without the use of a calculator. [2]

5 **(a)** Solve $\frac{3y-1}{3}+\frac{2y-4}{4}=y$. [4]

(b) Solve $\frac{3y+2}{2y-7}=4$. [4]

(c) The kinetic energy, E, of an object of mass m kg moving with velocity v m/s can be found using the formula $E=\frac{1}{2}mv^2$. Find the value of m when $E=120$ and $v=8$. [2]

---

6 Henry has some two-dollar, five-dollar and ten-dollar notes in his wallet. The number of two-dollar notes is thrice the number of ten-dollar notes. There are 2 more five-dollar notes than ten-dollar notes in his wallet.

(a) Given that Henry has x ten-dollar notes in his wallet, write down an expression, in terms of x, for the number of five-dollar notes he has in his wallet. [1]

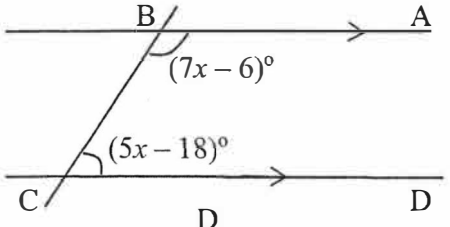
(b) **(i)** Henry used 4 two-dollar notes to buy himself a book. Write down an expression, in terms of x, for the number of two-dollar notes Henry has in his wallet after buying the book. [1]

(ii) Henry has \$44 left after buying the book. Form an equation in terms of x and find the value of x. [3]

---

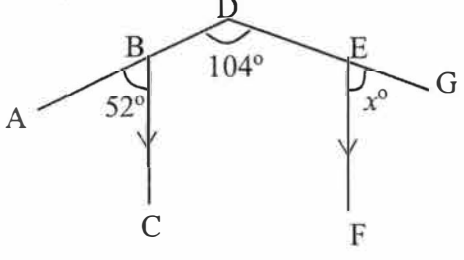
7 Find the value of x in each of the following figures. State your reasons clearly.

(a)



[3]

(b)



[3]

8 Answer the whole of this question on a sheet of plain paper.

(a) Construct a triangle ABC such that $AB = BC = 9$ cm and $AC = 6$ cm [3]

(b) Measure and write down the size of $\angle BAC$. [1]

(c) Construct the angle bisector of $\angle BAC$. Label this line l_1. [1]

(d) Construct the perpendicular bisector of AC. Label this line l_2. [1]

(e) Lines l_1 and l_2 meet at the point M.

Measure and write down the length of AM. [1]

---

9 Mobile phone plans now come with data bundles which include a fixed monthly component and a variable component depending on the monthly usage. Two student mobile plans offered by company M are shown in the table.

Student Price Plan	A	B
Monthly subscription	\$28	\$42
Free local incoming calls	Unlimited	
Free local outgoing calls *	150 min	100 min
Free local data bundle #	1 GB	4 GB

* If outgoing calls exceed the free minutes provided, excess usage is charged at \$0.002/second.

\# If data usage exceeds free data bundle provided, excess usage is charged at \$10/GB and capped at \$30 monthly.

Bobby made 130 minutes of local outgoing calls and used 3 GB of local data last month. Explain with the help of calculations which student price plan he should sign up for and why. [4]

End of Paper

Answer **all** the questions.

1 **(a)** Find the prime factorisation of 360, expressing the answer in index notation.

$360 = 2^3 \times 3^2 \times 5$

Answer (a) 360 =..... [1]

(b) Hence, find the smallest integer n, such that $\sqrt[3]{360 \times n}$ is an integer.

$$\sqrt[3]{360 \times n} = \sqrt[3]{2^3 \times 3^2 \times 5 \times n}$$
$$= \sqrt[3]{2^3 \times 3^2 \times 5 \times 3 \times 5^2}$$

$$n = 3 \times 5^2$$
$$= 75$$

Answer (b) n =..... [2]

2 Consider the numbers below.

$$-1.\dot{2}\dot{4},\ \frac{1}{\sqrt{2}},\ -\sqrt[3]{5},\ \frac{1}{3}$$

Write down

(a) the irrational numbers,

$\frac{1}{\sqrt{2}}$, $-\sqrt[3]{5}$

Answer (a) ..... [1]

(b) the rational numbers.

$-1.\dot{2}\dot{4}$, $\frac{1}{3}$

Answer (b) ..... [1]

Name: _____ ( ) Class: _____

3 By showing your working clearly, evaluate each of the following, expressing each answer in its simplest form.

(a)
$$\begin{aligned}
&5-\{12\times[(-7)^2-7]\div 4\}\\
&=5-\{12\times[49-7]\div 4\}\\
&=5-\{12\times 42\div 4\}\\
&=5-\{504\div 4\}\\
&=5-126\\
&=-121
\end{aligned}$$

Answer (a) ..... [3]

(b)
$$\begin{aligned}
&-1+\left[\frac{1}{2}+\left(-\frac{1}{3}\right)\right]+\left(-\frac{1}{30}\right)\\
&=-1+\left[\frac{1}{2}-\frac{1}{3}\right]-\frac{1}{30}\\
&=-1+\left[\frac{3}{6}-\frac{2}{6}\right]-\frac{1}{30}\\
&=-1+\frac{1}{6}-\frac{1}{30}\\
&=-\frac{30}{30}+\frac{5}{30}-\frac{1}{30}\\
&=-\frac{25}{30}-\frac{1}{30}\\
&=-\frac{26}{30}\\
&=-\frac{13}{15}
\end{aligned}$$

Answer (b) ..... [3]

4 Express

(a) 30 185 to 4 significant figures,

30 185 = 30 190 (to 4 s.f)

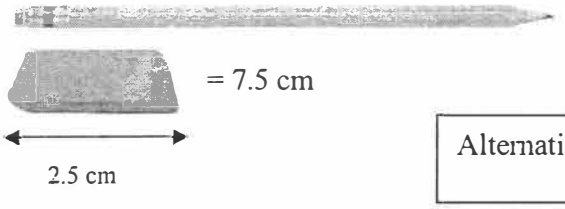
Answer (a) ..... [1]

(b) 743.253 to 2 decimal places.

743.253 = 743.25 (to 2 d.p)

Answer (b) ..... [1]

5 The figure below is a model of a pencil and an eraser. Using the given length of the eraser, estimate the length of the pencil.



Length of pencil $\approx 2.5 \times 3$

Alternative: 7.6 cm accepted

Answer ..... cm [1]

6 Without using a calculator, estimate, correct to 1 significant figure, the value of

$$\frac{\sqrt{2486} - 41.2}{7.99 \times 10.11}$$

$$\approx \frac{\sqrt{2500} - 41}{8 \times 10}$$

$$= \frac{9}{80}$$

$$= 0.1 \text{ (1 s.f)}$$

Answer ..... [2]

7 Lydia wants to buy a rectangular table cloth for her dining table. The area of the table cloth is 2.35 m^2 and the breadth is 1.05 m.

(a) Find the length of the table cloth, correct to 2 decimal places.

Length of table cloth = 2.35 ÷ 1.05
= 2.24 m (to 2 d.p)

Answer (a) ..... m [1]

(b) Using your answer in part (a), find the perimeter of the table cloth.

Perimeter of table cloth = (2 × 2.24) + (2 × 1.05)
= 6.58 m

Answer (b) ..... m [1]

8 In a classroom, each female student has 2 pens while each male student has 3 pens. Find the total number of pens if there are q number of female students and r number of male students in the class.

Total number of pens = $2q + 3r$

Answer ……pens [1]

9 Simplify the following.

(a) $(-3v + z) - (5v - 2z)$
$= -3v + z - 5v + 2z$
$= -3v - 5v + z + 2z$
$= -8v + 3z$

Answer (a) …… [2]

(b) $2x + y - 3(2x + 4y - 3)$
$= 2x + y - 6x - 12y + 9$
$= 2x - 6x + y - 12y + 9$
$= -4x - 11y + 9$

Answer (b) …… [2]

(c) $\frac{2h}{7} + \frac{3h+2}{5}$
$= \frac{10h}{35} + \frac{7(3h+2)}{35}$

$= \frac{10h+7(3h+2)}{35}$

$= \frac{10h+21h+14}{35}$

$= \frac{31h+14}{35}$

Answer (c) …… [3]

10 James has 3 boxes of clips. The first box contains $(6x-1)$ orange clips, the second box contains $(x+1)$ green clips and the third box contains $(2x+5)$ yellow clips.

(a) Find, in terms of x, the total number of clips in the boxes.

Total number of clips
$= (6x - 1) + (x + 1) + (2x + 5)$
$= 6x - 1 + x + 1 + 2x + 5$
$= 6x + x + 2x - 1 + 1 + 5$
$= (9x + 5)$

Answer (a) ..... clips [3]

(b) If there are 59 clips in total, find the value of x.

Total number of clips $= (9x + 5)$ cm
$9x + 5 = 59$
$9x = 59 - 5$
$9x = 54$
$x = \frac{54}{9}$
$x = 6$

Answer (b) $x =$..... [3]

11 Solve the equation $2(2x-3)-3(x+4)=0$

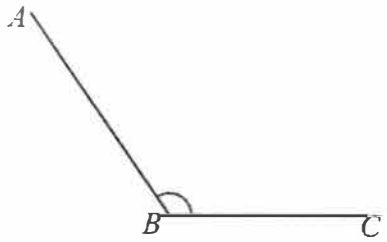
$2(2x-3)-3(x+4)=0$
$2(2x-3)=3(x+4)$
$4x-6=3x+12$
$4x-3x=6+12$
$x=18$

Alternative:

$2(2x-3)-3(x+4)=0$
$4x-6-3x-12=0$
$x-18=0$
$x=18$

Answer $x =$..... [3]

12 Lydia states that angle ABC is an acute angle. However, her teacher said that her answer is wrong. State the correct answer and explain why she is wrong.



Answer

.....

$\angle ABC$ is an obtuse angle.

.....

An acute angle is less than 90°

.....

$\angle ABC$ is more than 90° and less than 180°

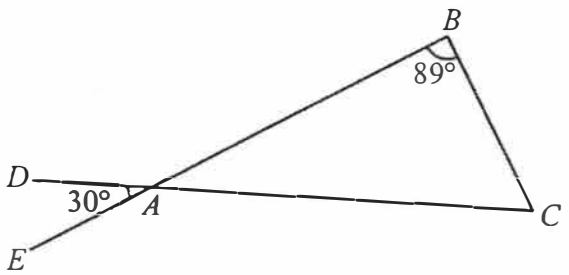
.....

.....

.....

[2]

13 In the diagram below, BE and CD are straight lines. Given that $\angle DAE = 30°$ and $\angle ABC = 89°$, giving reasons for your answer, find $\angle BCA$.



$\angle DAE = \angle CAB = 30°$ (vert. opp. $\angle$s)

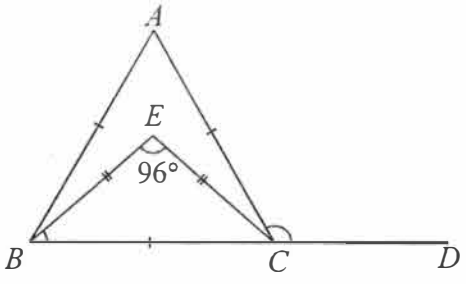
$\angle BCA = 180° - 89° - 30°$ ($\angle$ sum of triangle)
$= 61°$

No reasoning/degree symbol for all working steps, 1 mark deducted overall. **No deduction of marks if there is no degree symbol for the final answer.**

Alternative:
$\angle DAE = \angle CAB = 30°$ (vert. opp. $\angle$s)
$\angle DAB = 180° - 30°$
$= 150°$
$\angle BCA = 150° - 89°$ (ext. $\angle$ of triangle)
$= 61°$

Answer $\angle BCA =$ ..... [2]

14 In the diagram below, BCD is a straight line. It is given that $\angle BEC = 96°$, $AB = BC = AC$ and $EB = EC$



(a) Find $\angle EBC$, giving reasons for your answer.

$\angle EBC = (180° - 96°) \div 2$ (isos. triangle)

$= 42°$

No reasoning/no degree symbol for all working steps, 1 mark deducted overall. **No deduction of marks if there is no degree symbol for the final answer.**

Answer (a) $\angle EBC =$ ..... [1]

(b) Find $\angle ACD$, giving reasons for your answer.

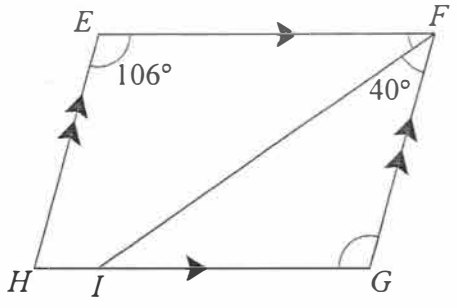
$\angle BAC = \angle ABC = 60°$ (equil. triangle)

$\angle ACD = 60° + 60°$
$= 120°$ (ext. $\angle$ of triangle)

No reasoning/no degree symbol for all working steps, 1 mark deducted overall. **No deduction of marks if there is no degree symbol for the final answer.**

Answer (b) $\angle ACD =$ ..... [2]

15 In the diagram below, $EFGH$ is a parallelogram. It is given that $\angle FEH = 106°$ and $\angle IFG = 40°$.



(a) Find $\angle FGH$, giving reasons for your answer.

$\angle FGH = \angle FEH = 106°$ (opp. $\angle$s of //gram)

No reasoning/no degree symbol for all working steps, 1 mark deducted overall. **No deduction of marks if there is no degree symbol for the final answer.**

Answer (a) $\angle FGH =$ ..... [1]

(b) Find $\angle EFI$, giving reasons for your answer.

$\angle EFI = 180° - 40° - 106°$ (int. $\angle$s)
$= 34°$

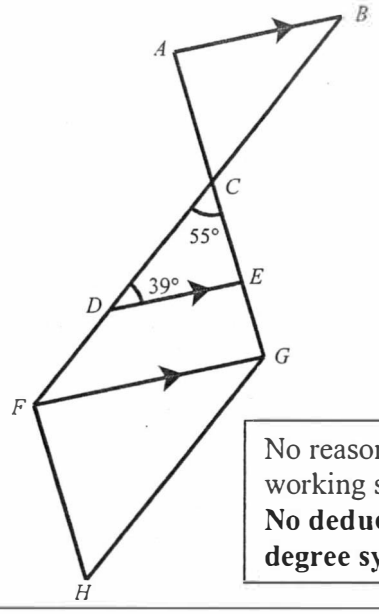
Alternative:
$\angle FIG = 180° - 40° - 106°$ ($\angle$ sum of triangle)
$= 34°$

$\angle EFI = \angle FIG = 34°$ (alt. $\angle$s)

No reasoning/no degree symbol for all working steps, 1 mark deducted overall. **No deduction of marks if there is no degree symbol for the final answer.**

Answer (b) $\angle EFI =$ ..... [1]

16 In the diagram below, *AB, DE* and *FG* are parallel lines. *FB* and *AG* are straight lines. It is given that $\angle EDC = 39°$ and $\angle DCE = 55°$.



No reasoning/no degree symbol for all working steps, 1 mark deducted overall. **No deduction of marks if there is no degree symbol for the final answer.**

(a) Find $\angle CGF$, giving reasons for your answer.

$\angle CED = 180° - 55° - 39°$ ($\angle$ sum of triangle)
$= 86°$

$\angle CGF = \angle CED = 86°$ (corr. $\angle$s)

Alternative:
$\angle CDE = \angle CFG = 39°$ (corr. $\angle$s)

$\angle CGF = 180° - 55° - 39°$ ($\angle$ sum of triangle)

$= 86°$

Answer (a) $\angle CGF =$ ..... [2]

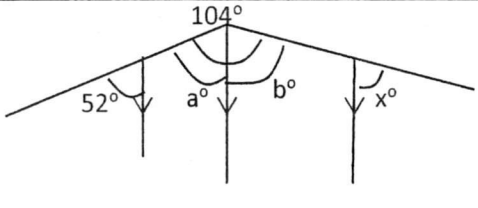
(b) Find the reflex $\angle ABC$, giving reasons for your answer.
$\angle ABC = \angle CDE = 39°$ (alt. $\angle$s)
Reflex $\angle ABC = 360° - 39°$ ($\angle$s at a point)
$= 321°$

Answer (b) $\angle ABC =$ ..... [2]

(c) Given that $\angle CFH = 125°$, **state** and **explain** the relationship between *CG* and *FH*.

Answer (c) *CG* and *FH* are parallel lines.
.....
$\angle CFH + \angle FCG = 180°$ (int. $\angle$s)
..... [2]

Qn	Answer
1(a)	15 = 3 x 5 20 = 2 x 2 x 5 27 = 3 x 3 x 3 LCM of 15, 20 and 27 = 2 x 2 x 3 x 3 x3 x 5 = 540 seconds 540 seconds = 9 minutes The three lighthouses will flash together at 12 09 am.
(b)	60 ÷ 9 = 6.667 It will happen for another 6 times between midnight and 1 am.
2(a)	86.4979 = 86.498 (5s.f.)
(b)	2.10273 = 2.1027 (5 s.f.)
3(a)	(i) $4(2x + y) - 3(5x - 6y)$ = 8x + 4y – 15x + 18 y = – 7x + 22 y (ii) $1 + \frac{3(2x+3)}{2} - \frac{4x-2}{3}$ $= \frac{6}{6} + \frac{9(2x+3)}{6} - \frac{2(4x-2)}{6}$ $= \frac{6+9(2x+3)-2(4x-2)}{6}$ $= \frac{6+18x+27-8x+4}{6}$ $= \frac{37+10x}{6}$
3(b)	(i)3x-2y+10 + 3x + 4y – 7 = 6x + 2y + 3 (ii) 9x + 5 y – (6x + 2y + 3) = 9x + 5y – 6x – 2y – 3 = 3 x + 3y – 3 (iii) Average score $= \frac{9x+5y}{3}$
4(a)	(i) $18ab + 6a - 36az$ = 6a(3b + 1 – 6z) (ii) $4c(x - 2y) + 3b(x - 2y)$ =(x – 2y)(4c + 3b)
4(b)	54321 x 36 – 54321 x 26 = 54321 (36 – 26) = 54321 (10) = 543 210
5(a)	$\frac{3y-1}{3} + \frac{2y-4}{4} = y$

	$\frac{4(3y-1)}{12}+\frac{3(2y-4)}{12}=y$ $\frac{12y-4}{12}+\frac{6y-12}{12}=y$ $\frac{18y-16}{12}=y$ 18y – 16 = 12y 18y – 12y = 16 6y = 16 $y = 2\frac{2}{3}$
(b)	$\frac{3y+2}{2y-7}=4$ 3y+2 = 4(2y-7) 3y+2 = 8y – 28 3y – 8y = -28 – 2 -5y =- 30 5y = 30 y = 6
(c)	$E=\frac{1}{2}mv^2$ When E = 120, v = 8, $120 = \frac{1}{2}$ x m x 8^2 $120 = \frac{1}{2}$ x m x 64 120 = 32 m m = 3.75
6(a)	No. of 5 dollars notes = 2 + x
(b)	(i) No. of 2 dollars notes left = 3x – 4 (ii) 2(3x-4) + 5(2+ x) + 10x = 44 6x – 8 + 10 + 5x + 10x = 44 21x = 44 + 8 – 10 21x = 42 X = 2
7(a)	7x – 6 + 5x – 18 =180 (int. ∠) 12 x – 24 = 180 12 x = 180 + 24 12 x = 204 x = 17
7(b)	 ∠a = 52° (corr. ∠) ∠b = 104° – 52° = 52° ∠x = 52° (corr ∠)
9	Amount Bobby pays on student price plan A = 28 + 10 x 2 = $ 48

	Amount Bobby pays on student price plan B = 42 + (130 – 100)x 60 x 0.002 = 42 + 3.60 = $45.60 Bobby should sign up for student price plan B as he pays less for his phone bill with this plan.