ZHONGHUA SECONDARY SCHOOL
MID-YEAR EXAMINATION 2011

Name of Pupil	:	_____ ( )
Class	:	1E ___
Subject / Code	:	MATHEMATICS / 4016
Level	:	Sec 1 Express
Date	:	11 May 2011
Duration	:	2 hours
Setter	:	
Vetted by	:	

INSTRUCTIONS TO CANDIDATES

Write your name, index number and class on all the work you hand in.

Write in dark blue or black pen. Do **not** use correction fluid or correction tape.

Omission of essential working will result in loss of marks.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to **three significant figures.** Give answers in degrees to **one decimal place.** For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

Answer **ALL** questions.

Section A : Write your answers in the spaces provided on the question paper.

Section B : Write your answers on the writing paper provided unless stated otherwise.

Hand in Section A and B separately.

Electronic calculators may be used in this paper, unless otherwise stated.

The marks for each question or part of a question are shown in the brackets [ ].

The total marks for this paper is **80.**

Error in	Marks deducted
Presentation	
Accuracy	
Missing/wrong units	

Section	Marks	
A		**50**
B		**30**
Total		**80**

This paper consists of **10** printed pages including this cover page.

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Section A (50 marks)

1 Evaluate

(a) $\dfrac{\sqrt[3]{54.87}+9.32}{3.16}$, giving your answer to 3 decimal places.

(b) $\dfrac{35-\sqrt[3]{29}}{\pi+\sqrt{[-2\times(-\frac{4}{5})]}}$; giving your answer to 3 significant figures.

Ans: (a) _____ [2]

Ans: (b) _____ [2]

2 Jeremy bought a watch for $48. When he sold it, he made a profit of 135% of the cost price. Find the selling price.

Ans: _____ [2]

3. Write the following numbers in descending order.

$$0.\dot{5},\quad 0.05,\quad 0.055,\quad \frac{1}{2},\quad 55\%$$

Ans: _____ [1]

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4. **Without using a calculator,** evaluate the following **showing all the steps clearly.** Leave your answer as a fraction in its lowest term.

$$\left[\left(-12\frac{1}{2}\right)+1\frac{1}{3}\div(-4)-\frac{5}{6}\right]\times\left(\frac{1}{2}\right)^2$$

Ans: (a) _____ [3]

5. Express
   (a) 0.009046 correct to 2 significant figures.
   (b) 84.2935 correct to the nearest hundredths.

Ans: (a) _____ [1]
Ans: (b) _____ [1]

6. Showing all the steps clearly, find the
   (a) highest common factor of 112 and 280.
   (b) smallest integer value of n such that $112n$ is a perfect square.

Ans: (a) _____ [2]
Ans: (b) _____ [1]

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7. A car travels 374 km along an expressway in Malaysia in 4 hours and 24 minutes.

(a) Express 4 hours and 24 minutes in hours.

(b) Find the average speed of the car in

(i) km/h

(ii) m/s

Ans: (a) _____ [1]

Ans: (bi) _____ [1]

Ans: (bii) _____ [2]

8. (a) Without the use of calculator, evaluate $\sqrt[3]{512}$.

(b) Given that $x = 3(y - 2z)$, find the value of z when $x = 13$ and $y = -17$.

Ans: (a) _____ [2]

Ans: (b) _____ [3]

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9. Factorise completely,

(a) $7xy^2 + 21y + 14xy$,

(b) $(x+2y)^2 - 5(x+2y)$

(c) $18xy + 9x - 6y - 3$

Ans: (a) _____ [1]

Ans: (b) _____ [2]

Ans: (c) _____ [3]

10. Write down the next 3 terms in the sequence

5, 10, 7, 14, 11, 22, 19, 38 ...

Ans: (a) _____, _____, _____ [3]

11. Simplify the following

(a) $\frac{3x-2y}{2} - \frac{5x-3y}{3}$

(b) $\frac{4}{x-y} + \frac{3}{y-x}$

Ans: (a) _____ [2]

Ans: (b) _____ [2]

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12. Solve the following equations

(a) $\frac{a}{a-5}=\frac{2}{5}$

(b) $\sqrt{2b-9}=5$

Ans: (a) _____ [3]

Ans: (b) _____ [3]

13. Three of the exterior angles of a pentagon are 105°, 75 ° and 80° while the other two interior angles are each equal to $2x°$. Find the value of x.

Ans: _____ [3]

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14. A piece of wire is bent to form a triangle with sides x cm, $(x+3)$ cm and $\frac{1}{2}x$ cm.

The same piece of wire can be used to form a rectangle with length $(x-2)$ cm and breadth $\frac{3}{4}$ as long as its length. Find

(a) the value of x,

(b) the length of the piece of wire.

Ans: (a) _____ [3]

Ans: (b) _____ [1]

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Section B (30 marks)

1. Consider the following pattern

a_1	=	$3+5$	=	$3+1(5)=$	8
a_2	=	a_1+5	=	$3+2(5)=$	13
a_3	=	a_2+5	=	$3+3(5)=$	18
a_4	=	a_3+5	=	$3+4(5)=$	23
	⋮		⋮		⋮
a_n	=	A	=	B	

(a) Write down the next two lines, a_5 and a_6, in the pattern. [3]

(b) If $a_x = 108$, find the value of x. [2]

(c) Write down the expressions for A and B in terms of a and/or n. [2]

2. Jingyi, Ahmad and Mark planned to contribute money in the ratio 6: 4: 5 respectively to buy a present for their friend. The cost of the present is $180.

(a) Calculate Jingyi's contribution. [2]

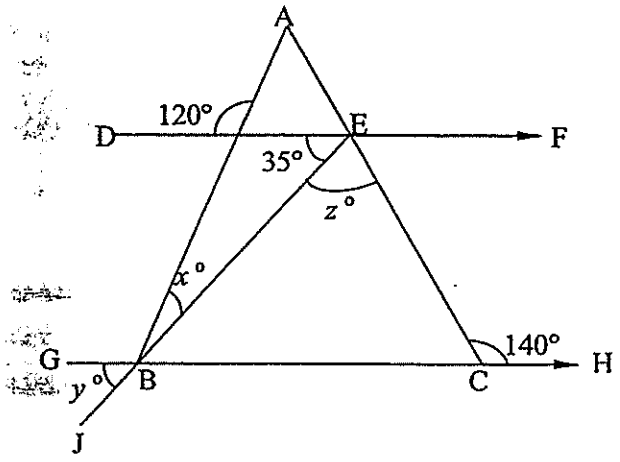
(b)(i) If Ahmad doubles his planned contribution and Jingyi halves her planned contribution, how much must Mark contribute for the present. [3]

3. The numerator of a fraction is 4 less than the denominator. If 1 is added to both the numerator, and the denominator, the fraction becomes $\frac{1}{2}$. Find the original fraction. [4]

4. Three traffic lights are positioned along Ang Mo Kio Street 22. The first traffic light turns green at 1 minute 12 seconds intervals, the second at 1 minute 36 seconds intervals and the third at 2 minutes intervals. All three traffic lights turn green together at 7.30 a.m. Find the time when the three traffic lights next turn green together. [4]

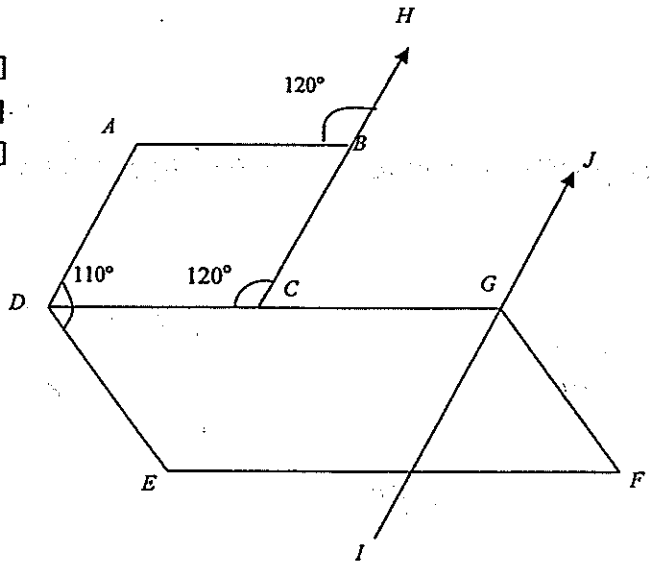
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5. In the diagram given below, DF and GH are parallel and JBE is a straight line, find the value of x, y and z. [5]



6. $ABCD$ is a rhombus and $DEFG$ is a parallelogram. Given that CH is parallel to IJ, $\angle ADE = 110°$ and $\angle BCD = 120°$, find

(a) ∠GDE, [2]
(b) ∠CGI, [1]
(c) ∠FGJ. [2]



- End of paper -
Please check through your working thoroughly!

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Section A (50 marks)

1 Evaluate

(a) $\frac{\sqrt[3]{54.87}+9.32}{3.16}$, giving your answer to 3 decimal places.

(b) $\frac{35-\sqrt[3]{29}}{\pi+\sqrt{[-2\times(-\frac{4}{5})]}}$, giving your answer to 3 significant figures.

(a) $\frac{\sqrt[3]{54.87}+9.32}{3.16}$ $= 7.245581808$ ——— M1

$= 7.25$ (3 s.f.) ——— A1

(b) $\frac{35-\sqrt[3]{29}}{\pi+\sqrt{[-2\times(-\frac{4}{5})]}}$ $= 4.151884124$ ——— M1

$= 4.152$ (3 d.p.) ——— A1

Ans: (a) _____ [2]

Ans: (b) _____ [2]

2 Jeremy bought a watch for $48. When he sold it, he made a profit of 135% of the cost price. Find the selling price.

Selling price of the watch $= \frac{135+100}{100}\times 48$ ——— M1

$= \$112.80$ ——— A1

Ans: _____ [2]

3. Write the following numbers in descending order.

$0.\dot{5}$, 0.05, 0.055, $\frac{1}{2}$, 55%

Ans: $0.\dot{5}$, 55%, $\frac{1}{2}$, 0.055, 0.05 [1]

A1

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4. **Without using a calculator,** evaluate the following **showing all the steps clearly.** Leave your answer as a fraction in its lowest term.

$$\left[\left(-12\frac{1}{2}\right)+1\frac{1}{3}\div(-4)-\frac{5}{6}\right]\times\left(\frac{1}{2}\right)^2$$

$$\left[\left(-12\frac{1}{2}\right)+1\frac{1}{3}\div(-4)-\frac{5}{6}\right]\times\left(\frac{1}{2}\right)^2=\left[-12\frac{1}{2}-\frac{1}{3}-\frac{5}{6}\right]\times\left(\frac{1}{4}\right)$$ ---------- M1

$$=-13\frac{2}{3}\times\frac{1}{4}$$ ---------- M1

$$=-3\frac{5}{12}$$ ---------- A1

Ans: (a) _____ [3]

5. Express

(a) 0.009046 correct to 2 significant figures.

(b) 84.2935 correct to the nearest hundredths.

(a) 0.009046 = 0.0090 (2 s.f.) ---------- A1

(b) 84.2935 = 84.29 (nearest hundredths) ----- A1 Ans: (a) _____ [1]

Ans: (b) _____ [1]

6. Showing all the steps clearly, find the

(a) highest common factor of 112 and 280.

(b) smallest integer value of n such that $112n$ is a perfect square.

2	112, 280
2	56, 140
2	28, 70
7	14, 35
	2, 5

---------- M1

(a) $HCF = 2^3 \times 7$

$= 56$ ---------- A1

(b) $112 = 2^3 \times 7$

$n = 2 \times 7$

$= 14$ ---------- A1

Ans: (a) _____ [2]

Ans: (b) _____ [1]

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7. A car travels 374 km along an expressway in Malaysia in 4 hours and 24 minutes.

(a) Express 4 hours and 24 minutes in hours.

(b) Find the average speed of the car in

(i) km/h

(ii) m/s

(a) $4\text{ h }24\text{ min} = 4 + \frac{24}{60}$

$= 4\frac{2}{5}\text{h}$ ---------- A1

(bi) Average seed of car $= \frac{374}{(4\frac{2}{5})}$

$= 85\text{ km/h}$ ---------- A1

(bii) Average speed of car $= \frac{85\times1000}{60\times60}$ ---------- M1

$= 23\frac{11}{18}\text{m/s}$ ---------- A1 (accept only fractional answer)

Ans: (a) _____ [1]

Ans: (bi) _____ [1]

Ans: (bii) _____ [2]

8. (a) Without the use of calculator, evaluate $\sqrt[3]{512}$.

(b) Given that $x = 3(y - 2z)$, find the value of z when $x = 13$ and $y = -17$.

(a)

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

---------- M1

$\sqrt[3]{512} = \sqrt[3]{2^9}$

$= 2^3$

$= 8$ ---------- A1

(b) $x = 3(y - 2z)$

$13 = 3(-17 - 2z)$ ---------- M1

$-2z - 17 = \frac{13}{3}$

$-2z = \frac{13}{3} + 17$ ---------- M1

$-2z = 12\frac{2}{3}$

$z = -10\frac{2}{3}$ ---------- A1

(do not accept -6.33)

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Ans: (a) _____ [2]

Ans: (b) _____ [3]

9. Factorise completely,

(a) $7xy^2+21y+14xy$,

(b) $(x+2y)^2-5(x+2y)$

(c) $18xy+9x-6y-3$

(a) $7xy^2+21y+14xy=7y(xy+3+2x)$ ------- B1

(b) $(x+2y)^2-5(x+2y)=(x+2y)(x+2y)-5(x+2y)$ ---------- M1

$=(x+2y)(x+2y-5)$ ---------- A1

(c) $18xy+9x-6y-3=9x(2y+1)-3(2y+1)$ --------- M1

$=(9x-3)(2y+1)$ ---------- M1

$=3(3x-1)(2y+1)$ ---------- A1

Ans: (a) _____ [1]
Ans: (b) _____ [2]
Ans: (c) _____ [3]

10. Write down the next 3 terms in the sequence

5, 10, 7, 14, 11, 22, 19, 38 ...

Ans: (a) 35 , 70 , 67 [3]

(A1 each)

11. Simplify the following

(a) $\frac{3x-2y}{2}-\frac{5x-3y}{3}$

(b) $\frac{4}{x-y}+\frac{3}{y-x}$

(a) $\frac{3x-2y}{2}-\frac{5x-3y}{3}=\frac{3(3x-2y)-2(5x-3y)}{6}$

$=\frac{9x-6y-10x+6y}{6}$ ---------- M1

$=-\frac{x}{6}$ ---------- A1

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(b) $\frac{4}{x-y}+\frac{3}{y-x}=\frac{4}{x-y}+\frac{3}{-(x-y)}$

$=\frac{4}{x-y}-\frac{3}{x-y}$ ---------- M1

$=\frac{1}{x-y}$ ---------- A1

Ans: (a) _____ [2]

Ans: (b) _____ [2]

12. Solve the following equations

(a) $\frac{a}{a-5}=\frac{2}{5}$

(b) $\sqrt{2b-9}=5$

(a) $5(a-5)(\frac{a}{a-5})=(\frac{2}{5})(5(a-5))$ ---------- M1

$5a=2(a-5)$

$5a=2a-10$ ---------- M1

$3a=-10$

$a=-3\frac{1}{3}$ ----------A1

Ans: (a) _____ [3]

Ans: (b) _____ [3]

13. Three of the exterior angles of a pentagon are 105°, 75° and 80° while the other two interior angles are each equal to $2x°$. Find the value of x.

$(180°-105°)+(180°-75°)+(180°-80°)=[(5-2)\times 180°]-2(2x°)$ ---------- M1

$75°+105°+100°=(3\times 180°)-4x°$

$280°=540°-4x°$ ---------- M1

$4x°=260°$

$x°=65°$

$x=65$ ---------- A1

Ans: _____ [3]

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14. A piece of wire is bent to form a triangle with sides x cm, $(x+3)$ cm and $\frac{1}{2}x$ cm.

The same piece of wire can be used to form a rectangle with length $(x-2)$ cm and breadth $\frac{3}{4}$ as long as its length. Find

(a) the value of x,

(b) the length of the piece of wire.

(a) $x+(x+3)+\frac{1}{2}x=2(x-2)+2(\frac{3}{4})(x-2)$ ---------- M1

$x+x+3+\frac{1}{2}x=2x-4+\frac{3x}{2}-3$ ---------- M1

$-x=-10$

$x=10$ ---------- A1

(b) Length of wire $= x+x+3+\frac{1}{2}x$

$=10+10+3+\frac{1}{2}(10)$

$=28$ cm ---------- A1

Ans: (a) _____ [3]

Ans: (b) _____ [1]

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Section B (30 marks)

1. Consider the following pattern

a_1	=	$3+5$	=	$3+1(5)=$	8
a_2	=	a_1+5	=	$3+2(5)=$	13
a_3	=	a_2+5	=	$3+3(5)=$	18
a_4	=	a_3+5	=	$3+4(5)=$	23
	⋮		⋮		⋮
a_n	=	A	=	B	

(a) Write down the next two lines, a_5 and a_6, in the pattern. [3]

(b) If $a_x = 108$, find the value of x. [2]

(c) Write down the expressions for A and B in terms of a and/or n. [2]

(a) M1

$a_5 = a_4 + 5 = 3 + 5(5) = 28$

$a_6 = a_5 + 5 = 3 + 6(5) = 33$ } A1

M1

(b) $a_x = 108$

$3 + x(5) = 108$ ---------- M1

$3 + 5x = 108$

$5x = 105$

$x = 21$ ---------- A1

(c) $a_n = A = B$

$A = a_{n-1} + 5$ ---------- A1/B1

$B = 3 + n(5)$

$= 3 + 5n$ ---------- A1/B1

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2. Jingyi, Ahmad and Mark planned to contribute money in the ratio 6: 4: 5 respectively to buy a present for their friend. The cost of the present is $180.

(a) Calculate Jingyi's contribution. [2]

(b)(i) If Ahmad doubles his planned contribution and Jingyi halves her planned contribution, how much must Mark contribute for the present. [3]

(a) Jingyi's contribution $= \frac{6}{15} \times \$180$ ---------- M1

$= \$72$ ---------- A1

(b) Ahmad's contribution $= 2(\frac{4}{15}) \times \$180$

$= \$96$ ---------- M1

Jingyi's contribution $= \$72 \div 2$

$= \$36$ ---------- M1

Mark's contribution $= \$(180-96-36)$

$= \$48$ ---------- A1

3. The numerator of a fraction is 4 less than the denominator. If 1 is added to both the numerator, and the denominator, the fraction becomes $\frac{1}{2}$. Find the original fraction. [4]

Let x be the numerator.

$$\frac{x+1}{x+4+1} = \frac{1}{2}$$ ---------- M1

$$2(x+5)(\frac{x+1}{x+5}) = \frac{1}{2}(2(x+5))$$

$2(x+1) = x+5$ ---------- M1

$2x+2 = x+5$

$x = 3$ ---------- M1

Fraction is $\frac{3}{7}$ ---------- A1

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4. Three traffic lights are positioned along Ang Mo Kio Street 22. The first traffic light turns green at 1 minute 12 seconds intervals, the second at 1 minute 36 seconds intervals and the third at 2 minutes intervals. All three traffic lights turn green together at 7.30 a.m. Find the time when the three traffic lights next turn green together. [4]

2	72, 96, 120
2	36, 48, 60
3	18, 24, 30
2	6, 8, 10
	3, 4, 5

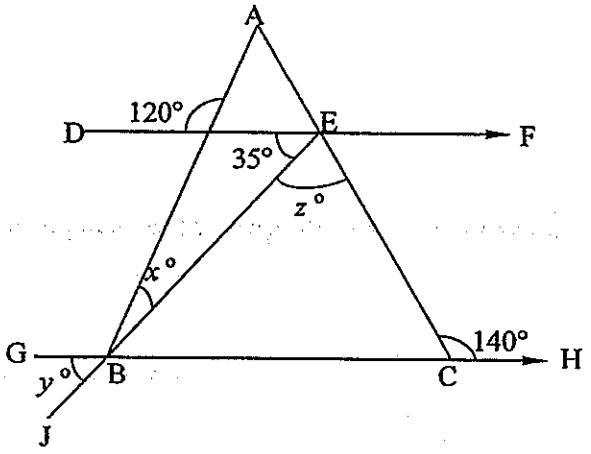
---------- M1

$LCM = 2^3 \times 3^2 \times 4 \times 5$
$= 1440$ ---------- M1

1440s = 24min ---------- M1

Time the 3 traffic lights turn green together
= 7.54 am ---------- A1

5. In the diagram given below, DF and GH are parallel and JBE is a straight line, find the value of x, y and z. [5]



$x = 180° - 120° - 35°$ (∠ sum of triangle) ----------M1
$= 25°$

$y = 35°$ (corr. ∠s , DF// GH) ---------- A1

$\angle DEB = \angle EBC = 35°$ (alt. ∠ , DF//GH)

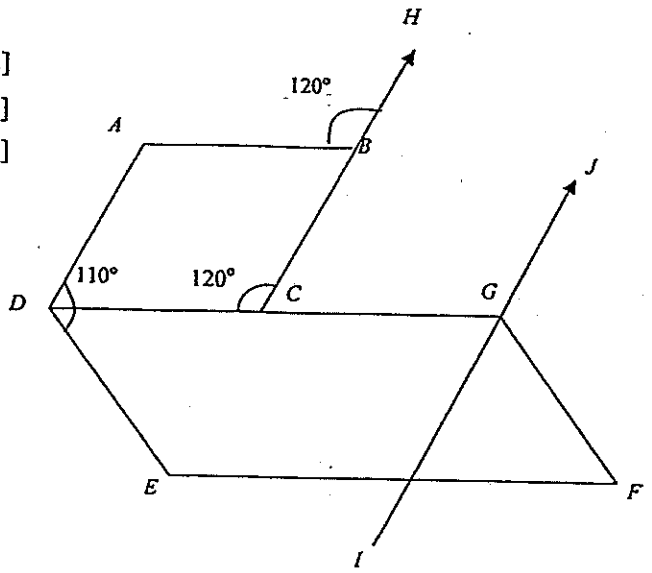
$z = 140° - 35°$ (ext ∠ of triangle) ---------- M1

$= 105°$ ---------- A1

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6. *ABCD* is a rhombus and *DEFG* is a parallelogram. Given that CH is parallel to IJ, $\angle ADE = 110°$ and $\angle BCD = 120°$, find

(a) $\angle GDE$, [2]
(b) $\angle CGI$, [1]
(c) $\angle FGJ$. [2]



(a) $\angle ADC = \angle ABC$

$= 180° - 120°$ (opp $\angle s$ of rhombus)

$= 60°$ ---------- M1

$\angle GDE = 110° - 60°$

$= 50°$ ---------- A1

(b) $\angle BCG = \angle ADC$ (corr $\angle s$, AD//HC)

$= 60°$

$\angle CGI = \angle BCG$ (alt. $\angle s$, CH//IJ) ---------- A1/B1

$= 60°$

(c) $\angle JGD = 120°$ (corr. $\angle s$,, CH // IJ)

$\angle DGF = 130°$ (opp $\angle s$ of //gram)

$\angle FGJ = 360° - 120° - 130°$ ($\angle s$ at a pt) ---------- M1

$= 110°$ ---------- A1

- End of paper -

Please check through your working thoroughly!

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