PRESBYTERIAN HIGH SCHOOL

2016 MID-YEAR EXAMINATION
SECONDARY ONE EXPRESS
MATHEMATICS

Name: _____ ( ) Class: _____

Duration: 2 hours 30 minutes Date: 12 May 2016

INSTRUCTIONS TO CANDIDATES:

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

1. Write in dark blue or black ink.
2. Fill in your name, register number and class on the top of this page.
3. Answer all **Section A questions in the space provided.**
4. Answer all **Section B questions on the writing paper provided.**
   (Section B Question 19 and 20 to be done on the answer sheet provided.)
5. All essential working must be clearly shown. Omission of essential working will result in loss of marks.
6. Calculators are allowed to be used, unless otherwise stated by the question(s).
7. Hand in **Section A** and **Section B** separately.

INFORMATION TO CANDIDATES:

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 100.

For Examiner's Use	
Section A	50
Section B	50
Total	100

Setter: Mrs Faith Chen

This question paper consists of 11 printed pages (including this cover page) and 1 blank page

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Section A (50 marks)
Answer ALL questions.

1. Write down
   (a) the first three multiples of 31,
   (b) the index notation of $3 \times 11 \times 3 \times 5 \times 11$.

Answer: (a) _____ [1]

(b) _____ [1]

2. Round off
   (a) 79.567 to the nearest whole number,
   (b) 895 567 to 2 significant figures,
   (c) 0.0462 to 2 decimal places.

Answer: (a) _____ [1]

(b) _____ [1]

(c) _____ [1]

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3. (a) Find the square of $5^6 \times 7^9 \times 11^3$, leaving your answer in index notation.
(b) Explain why the result in (a) is a perfect cube.
(c) Hence, find the cube root of the result in (a), leaving your answer in index notation.

Answer: (a) _____ [1]

(b) _____ [1]

(c) _____ [1]

4. If $14625 = 3^a \times 5^b \times 13^c$, find the values of a, b and c.

Answer: $a =$ _____ [1]

$b =$ _____ [1]

$c =$ _____ [1]

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5. Write the correct sign, "<", ">" or "=" on the answer line provided.

(a) $57 \square \sqrt[3]{-196\ 363}$

(b) $79\frac{2}{3} \square 79.\dot{6}$

Answer: (a) _____ [1]

(b) _____ [1]

6. Simplify the following algebraic expressions.

(a) $5p \times p^2 \times 2m$

(b) $k \times 3k^2 \div 6w$

(c) $n \div 4n^2 - (-2 \div q)^3$

Answer: (a) _____ [1]

(b) _____ [2]

(c) _____ [2]

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7. Evaluate the following using a calculator, rounding off the answer to 3 significant figures.

(a) $\dfrac{49.6^2 + 13.5}{\sqrt[3]{9.87}}$

(b) $\dfrac{452.5 - 25.6^2}{19.75 + 7.089}$

Answer: (a) _____ [1]

(b) _____ [1]

8. Write an algebraic expression for each of the following word statements.

(a) The sum of $5k$ hours and $8y$ minutes. Express your answer in minutes.

(b) The difference in the value between x 2-dollar notes and w 20-cent coins. Express your answer in cents.

Answer: (a) _____ minutes [2]

(b) _____ ___ cents [2]

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9. **Without** the use of a calculator, evaluate

(a) $10 - (-5) + (-3)$

(b) $(-30 + 5)^2 - (-2 \times 6)$

(c) $2\frac{1}{5} + \frac{4}{5} \div \left(-\frac{2}{3}\right)^2$

Show your steps clearly.

Answer: (a) _____ [2]

(b) _____ [2]

(c) _____ [3]

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10. A shopkeeper bought 28 pens at x cents each and 42 pencils at y cents each. He then repacked the pens and pencils into packets which contained 4 pens and 6 pencils. He sold each packet for $(4x + 8y)$ cents each. Write down, in terms of x and y, an expression for

(a) the amount of money he spent on the stationery,
(b) the total amount of money received for selling all the packets of stationery,
(c) the total amount of profit made.

Answer: (a) _____ cents [1]

(b) _____ _____ cents [1]

(c) _____ cents [2]

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11. Factorise the following.

(a) $15ax - 35ay - 25az$

(b) $3a(2c-d) - 8b(2c-d)$

(c) $3xy - 12yz - 27xy$

Answer: (a) _____ _____ [1]

(b) _____ [1]

(c) _____ _____ [2]

12. Given the expression $5x^2 - \frac{3}{5}x + 4xy - 78$. Write down

(a) the coefficient of x,

(b) the coefficient of xy,

(c) the constant term,

(d) the total number of terms.

Answer: (a) _____ [1]

(b) _____ [1]

(c) _____ [1]

(d) _____ [1]

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13. Simplify the following algebraic expressions.

(a) $4(5a - 2b) - 6(b - 2a)$

(b) $5m - 3(n - 5) + 7(-4n)$

(c) $\frac{3(u + 4t)}{4} \quad \frac{2(-4t)}{5}$

Answer: (a) _____ [2]

(b) _____ [2]

(c) _____ [3]

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Section B (50 marks)
Answer ALL questions.

14. Solve the following equations, showing the steps clearly.

(a) $1-2(3x+5)=-18$ [3]

(b) $\frac{3c+7}{5}=\frac{-c+4}{3}+3$ [3]

(c) $\frac{7}{5y-2}=\frac{2}{3-4y}$ [3]

15. (a) Express 1512 as a product of its prime factors, giving your answer in index notation. [2]

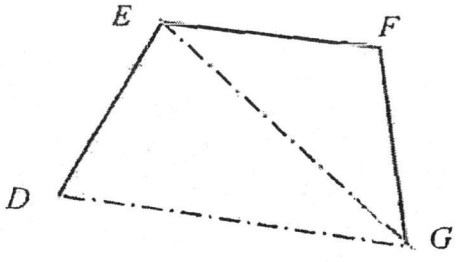
(b) Given that $84=2^2\times3\times7$, find

(i) the smallest positive integer w where $84w$ is a perfect square. [1]

(ii) the Highest Common Factor (HCF) of 84 and 1512. [2]

16. (a) Three of the interior angles of a n-sided polygon are 85°, 90° and 125°. The remaining angles are each 170°. Find the value of n. [2]

(b) $DEFG$ is part of a 6-sided regular polygon.



Calculate

(i) the sum of the interior angles of a 6-sided regular polygon, [1]

(ii) the reflex angle $\angle DEF$, [2]

(iii) $\angle EGF$. [2]

17. (a) A pot salesman is paid a monthly salary of $\$B$, which is made up of a basic wage of \$600 with a commission of \$2 for each of the n pots that he sells.

(i) Write a formula connecting B and n. [1]

(ii) Calculate the amount of monthly salary the salesman earned when he sold 96 pots. [2]

(iii) At the end of another month, the salesmanearned \$742. How many pots did he sell? [2]

(b) John is 15 years older than his brother Benny. Six years ago, John was six times as old as Benny.

(i) Given that Benny's present age is x years old, form an equation in terms of x and solve it. [3]

(ii) Hence, or otherwise, find out the present age of John. [1]

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18. Three exterior angles of a 8-sided polygon are 30°, 71°, 74°. The size of each remaining exterior angle of the polygon is $y°$

(a) Calculate the value of y. [2]

(b) Hence, find

(i) the smallest interior angle of the polygon. [2]

(ii) the largest interior angle of the polygon. [2]

Answer question 19 on the answer sheet provided.

19. In the diagram below, calculate the size of

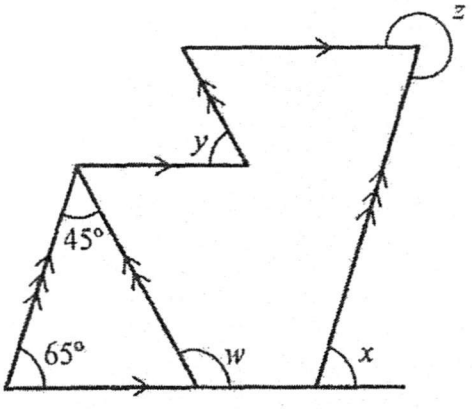
(a) $\angle w$, [2]

(b) $\angle x$, [2]

(c) $\angle y$ and [2]

(d) $\angle z$. [2]

Show your working and **angle properties** clearly.



Not drawn to scale

Answer question 20 on the answer sheet provided.

20. (a) Construct a quadrilateral $PQRS$ in which $PR = 12.4$ cm, $PS = 9.5$ cm, $RS = 11.5$ cm and $\angle PQR = 106°$. Label all the information clearly on your drawing. PQ has been drawn for you. [3]

(b) On the same diagram, construct

(i) the perpendicular bisector of the line segment RS, [1]

(ii) the angle bisector of $\angle PSR$. [1]

(c) The perpendicular bisector of RS meets the angle bisector of $\angle PSR$ at point Y. Measure and write down the length of SY. [1]

END OF PAPER

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1) SECTION A

a) 31, 62, 93

b) $3 \times 11 \times 3 \times 5 \times 11$

$= 3^2 \times 5 \times 11^2$

2) a) 80

b) 900 000

c) 0.05

3) $(5^6 \times 7^9 \times 11^3)^2$

a) $= 5^{12} \times 7^{18} \times 11^6$

b) The index is a multiple of 3

c) $5^4 \times 7^6 \times 11^2$

4)

3	14625
3	4875
5	1625
5	625
5	125
5	25
5	5
	1

$= 3^2 \times 5^3 \times 13^1$

$a = 2, b = 3, c = 1$

5 a) >

b) =

6 a) $5p \times p^2 \times 2m$

$= 10p^3m$

b) $k \times 3k^2 \div 6w$

$= \frac{3k^3}{6w}$

$= \frac{k^3}{2w}$

c) $n \div 4n^2 - (-2 \div q)^3$

$= \frac{n}{4n^2} - \left(\frac{-2}{q}\right)^3$

$= \frac{1}{4n} + \frac{8}{q^3}$

$= \frac{q^3 + 32n}{4nq^3}$

7 a) 1150

b) −7.56

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8 a) $(5k \times 60 + 8y)$

$= (300k + 8y)$ minutes

b) $(200x - 20w)$ cents

9 a) $10 - (-5) + (-3)$

$= 10 + 5 - 3$

$= 15 - 3$

$= 12$

b) $(-30 \div 5)^2 - (-2 \times 6)$

$= (-6)^2 - (-12)$

$= 36 + 12$

$= 48$

c) $2\frac{1}{5} + \frac{4}{5} \div \left(-\frac{2}{3}\right)^2$

$= 2\frac{1}{5} + \frac{4}{5} \times \frac{9}{4}$

$= 2\frac{1}{5} + \frac{9}{5}$

$= 4$

10 a) $(28x + 42y)$

b) $28 \div 4 = 7$

$42 \div 6 = 7$

7 packets

b) $7(4x + 8y)$ cents

c) $7(4x + 8y)$

$-(28x + 42y)$

$= 28x + 56y$

$-28x - 42y$

$= 14y$ cents

11 a) $15ax - 35ay - 25az$

$= 5a(3x - 7y - 5z)$

b) $3a(2c - d) - 8b(2c - a)$

$= (3a - 8b)(2c - d)$

c) $3xy - 12yz - 27xy$

$= 3y(x - 4z - 9x)$

$= 3y(-4z - 8x)$

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12 a) $-\frac{3}{5}$

b) 4

c) -78

d) 4

13 a) $4(5a-2b)-6(b-2a)$

$= 20a-8b-6b+12a$

$= 20a+12a-8b-6b$

$= 32a-14b$

b) $5m-3(n-5)+7(-4n)$

$= 5m-3n+15-28n$

$= 5m-31n+15$

c) $3\left(\frac{u+4t}{4}\right)-2\left(\frac{-4t}{5}\right)$

$= \frac{(5)(3)(u+4t)-8(-4t)}{20}$

$= \frac{15u+60t+32t}{20}$

$= \frac{15u+92t}{20}$

SECTION B

14 a) $1-2(3x+5)=-18$

$1-6x-10=-18$

$-6x-9=-18$

$-6x=-9$

$x=\frac{9}{6}$

$x=1\frac{1}{2}$

b) $\frac{3c+7}{5}=\frac{-c+4}{3}+\frac{3}{1}$

$\frac{3c+7}{5}=\frac{-c+4+9}{3}$

$\frac{3c+7}{5}=\frac{13-c}{3}$

$3(3c+7)=5(13-c)$

$9c+21=65-5c$

$14c=44$

$c=3\frac{2}{14}$

$=3\frac{1}{7}$

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c) $\frac{7}{5y-2} = \frac{2}{3-4y}$

$7(3-4y) = 2(5y-2)$

$21 - 28y = 10y - 4$

$-28y - 10y = -25$

$-38y = -25$

$y = \frac{25}{38}$

15 a)

2	1512
2	756
2	378
3	189
3	63
3	21
7	7
	1

$= 2^3 \times 3^3 \times 7$

b) $2^2 \times 3 \times 7 \times W =$ perfect square

$\therefore W = 3 \times 7$

$= 21$

ii) HCF

$= 2^2 \times 3 \times 7$

$= 84$

16 a) $(n-2) \times 180° - (85 + 90 + 125) = 170(n-3)$

$180n - 360° - 300 = 170(n-3)$

$180n - 660° = 170n - 510$

$10n = 150$

$n = 15$

b) i) $(6-2) \times 180°$

$= 720°$

ii) $\frac{720°}{6}$

$= 120°$

$360° - 120°$

$= 240°$

iii) LEGF $= (180° - 120°) \div 2$

$= 30°$

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17 a) i) $B = \$600 + 2n$

ii) $n = 96$

$B = 600 + 96 \times 2$

$= \$792$

iii) $600 + 2n = 742$

$2n = 742 - 600$

$2n = 142$

$n = 71$

b) Benny = x years old

John = $(x+15)$ years old

Six years ago

$x - 6$ = Benny

$x + 15 - 6$ = John

John = $x + 9$

$x + 9 = 6(x - 6)$

$x + 9 = 6x - 36$

$x - 6x = -36 - 9$

$-5x = -45$

$x = 9$

John = $9 + 15$

= 24 years old

18. $360° - 30° - 71° - 74°$

$= 185°$

$185 \div 5 = 37$

$\therefore y = 37°$

a)

b) $180° - 74° = 106°$

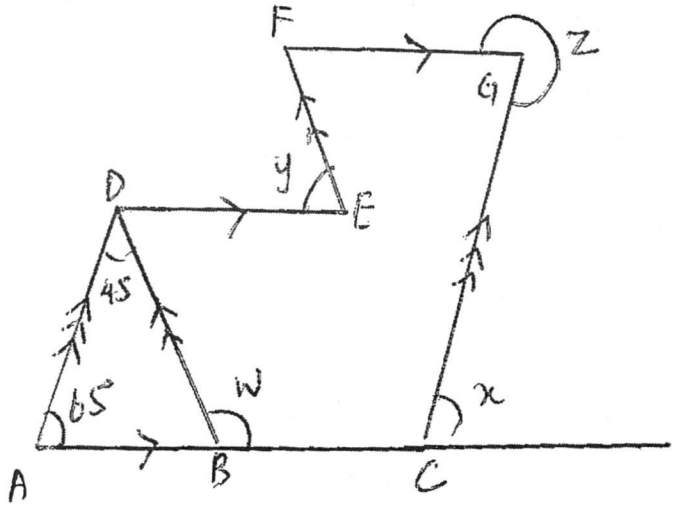
$180° - 30° = 150°$

i) $\therefore$ Smallest interior = $106°$

ii) Largest interior = $150°$

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19.



a) $\angle W = 45° + 65°$ (Interi Ls of Δ)

$= 110°$

b) $\angle x = 65°$ (corresponding Ls)

c) $\angle y = \angle BDE$ (Interior Ls are supplementary)

$= 180° - 110°$

$= 70°$

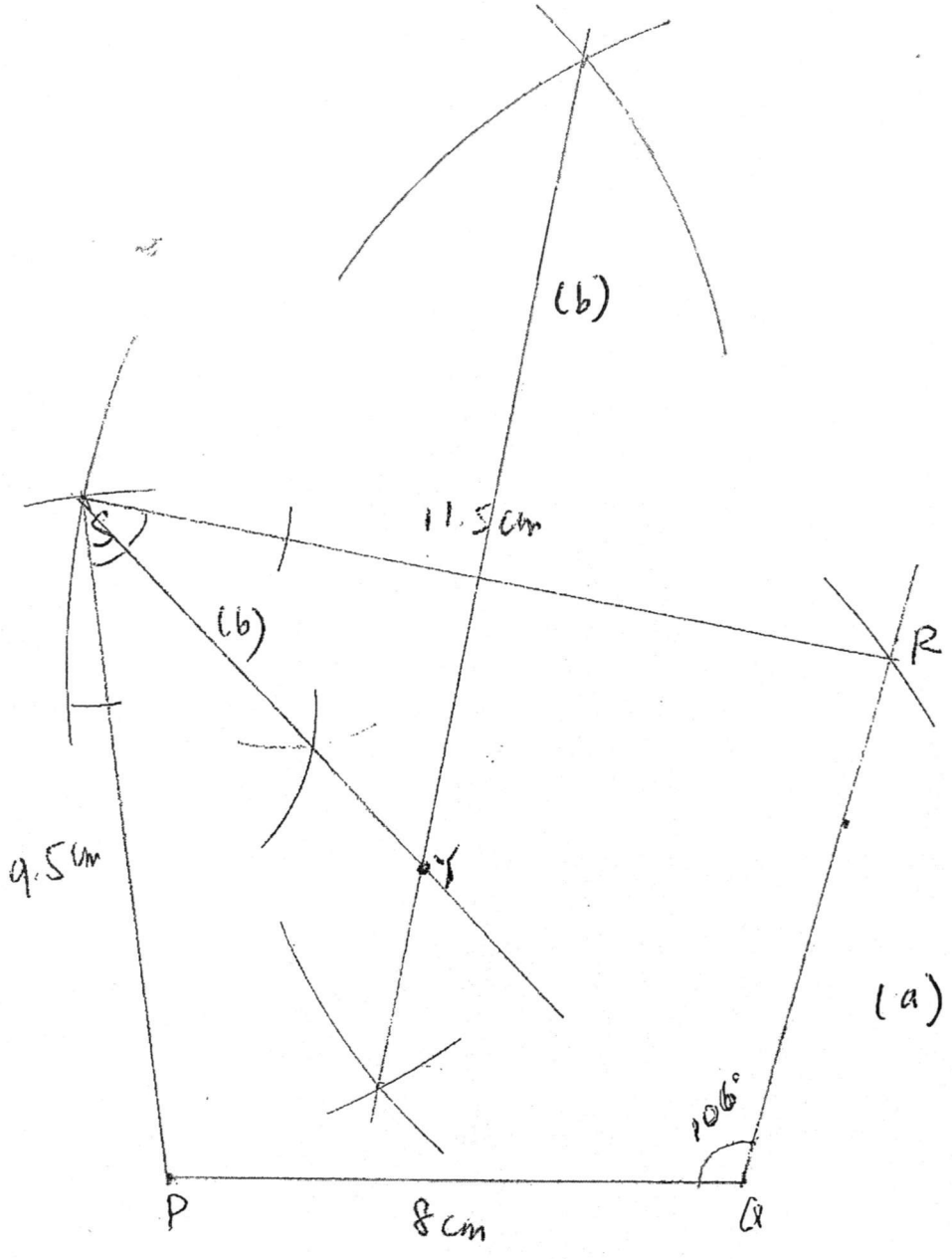
d) $\angle z = 360° - \angle FGC$ (Ls at a point)

$= 360° - \angle x$

$= 360° - 65°$

$= 295°$

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(a) Construction

c) SY = 7 cm (±0.1).

Based on PQ = 8 cm

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