Candidate Name: _____

HUA YI SECONDARY SCHOOL

MID-YEAR EXAMINATION 2008
SECONDARY TWO EXPRESS

MATHEMATICS

Part 1

Candidates answer on the Question Paper.
Additional Materials: Nil

Date: 8 May 2008

Time: 1 hr 15 min

INSTRUCTIONS TO CANDIDATES

Write your Name, Class and Index Number in the spaces at the top of this page.
Answer **all** questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS CAN BE USED IN THIS PAPER.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

FOR EXAMINER'S USE
50

Set by: Mr Leow Guan Sin

This document consists of 10 printed pages.

1   Round off 1.098344

    (a) to two significant numbers,

    (b) to two decimal places.

    Answer (a) .... [1]

    (b) .... [1]

2   Factorise $3y^2 - 11y + 10$.

    Answer .... [2]

3   Simplify $\dfrac{ab - b^2}{(a-b)^2}$.

    Answer .... [2]

4   Given that $x = \dfrac{7 + 3a}{a - 5}$, express a in terms of x.

    Answer a = ... [2]

5   Expand and simplify

    (a) $(2p-7q)(5p+6q)$,

    (b) $(2x+5)^2-3(7x-1)$.

Answer (a) _____ [2]

(b) _____ [3]

6   Simplify, leaving each answer as a fraction in its lowest terms,

    (a) $\dfrac{\frac{2}{x}+\frac{4}{y}}{\frac{2}{x}}$,

    (b) $\dfrac{3}{2x-1}-\dfrac{5}{2-4x}$.

Answer (a) _____ [2]

(b) _____ [2]

7   Given that 2 cm on a map represents 3 km on the actual ground,

   (a) express the scale of the map in the form 1 : r,

   (b) find the actual area, in square kilometres (km^2), of a field whose area on the map is 5 cm^2.

Answer (a) --- [2]

(b) --- km^2 [2]

8   Solve the simultaneous equations

   $3x - 4y = 30$,

   $2x - 7y = 33$.

Answer x = --

y = --- [3]

9   Consider the pattern:

Line 1: $11 - 2 = 3^2$

Line 2: $1\ 111 - 22 = 33^2$

Line 3: $111\ 111 - 222 = 333^2$

$$\vdots$$

$$x - y = 33\ 333\ 333^2$$

(a)   Write down Line 5 in the pattern.

(b)   State the value of x and of y.

Answer (a) _____ [1]

(b) x = _____

y = _____ [2]

10

x	16	18	q
y	8	p	24

The table above shows some values of x and the corresponding values of y. Given that x and y are in direct proportion,

(a)   express y in terms of x,

(b)   find the value of p and of q.

Answer (a) _____ [2]

(b) p = _____

q = _____ [2]

11   Mr Raju, a salesman gets 7% commission on his sales. If his commission for selling a product is $686, calculate the selling price of the product.
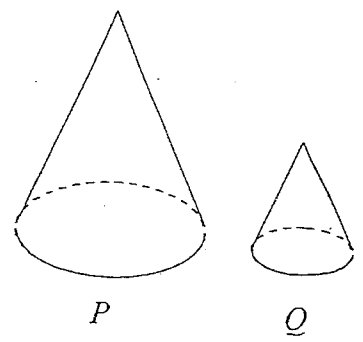
Answer $ .... [2]

12   In the figure below, not drawn to scale, ACE and BCD are straight lines, AB is parallel to DE, AB = 1.6 cm, AC = 3.2 cm, BC = 2.4 cm and CD = 1.5 cm. Calculate the value of x and of y.
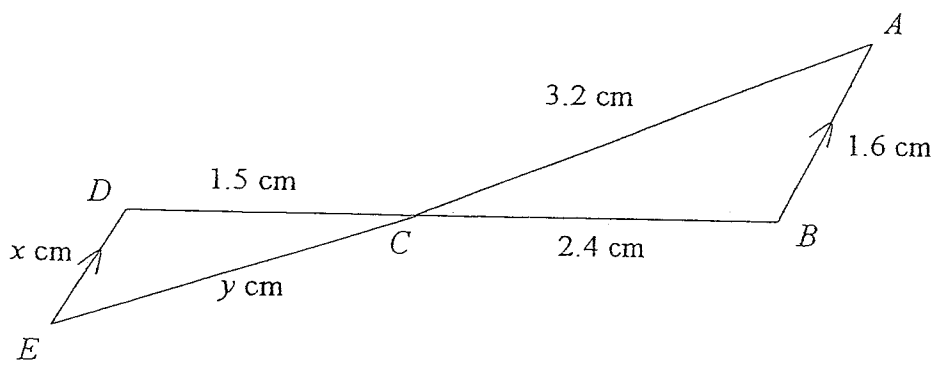
Answer x = ...

y = ... [3]

13 Cone P is reduced to cone Q as shown. The height of Cone P is 24 cm and that of Cone Q is 10 cm. Find

  (a) the scale factor of the reduction,

  (b) the circumference of the base of Cone Q if circumference of the base of Cone P is 84 cm.
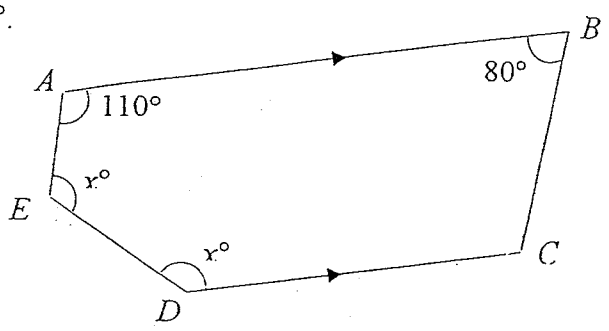
$$P \qquad Q$$

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

(b) .... cm [2]

14 Given that $F = \dfrac{m(v-u)}{t}$, find

  (a) the value of F when $m = 4$, $t = 3$, $v = 27$ and $u = 9$,

  (b) the value of u when $F = 80$, $m = 6$, $v = 25$ and $t = 1.5$.

Answer *(a)* $F =$ .... [1]
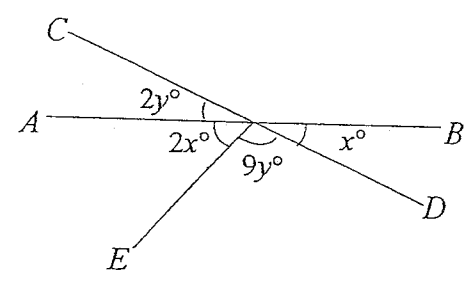
(b) $u =$ .... [2]

15 The diagram shows a polygon *ABCDE* in which *AB* is parallel to *DC*.
$\angle A = 110°$, $\angle B = 80°$ and $\angle E = \angle D = x°$.

(a) Name the polygon,

(b) Find the value of x.

Answer (a) _____ [1]

(b) $x = $ _____ [3]

16 In the figure below, *AB* and *CD* are straight lines.
Find the value of x and of y.

Answer $x = $ _____

$y = $ _____ [4]

END OF PART 1

Marking Scheme

1 (a) 1.1   B1
   (b) 1.10   B1

2

$3y$	-5	$-5y$
y	-2	$-6y$
$3y^2$	10	$-11y$

M1

$3y^2 - 11y + 10 = (3y - 5)(y - 2)$ A1

3 $\dfrac{ab - b^2}{(a-b)^2} = \dfrac{b(a-b)}{(a-b)^2}$ M1

$= \dfrac{b}{a-b}$ A1

4 $x = \dfrac{7 + 3a}{a - 5}$

$ax - 5x = 7 + 3a$

$ax - 3a = 5x + 7$

$a(x - 3) = 5x + 7$ M1

$a = \dfrac{5x + 7}{x - 3}$ A1

5 (a) $(2p - 7q)(5p + 6q)$

$= 2p(5p + 6q) - 7q(5p + 6q)$ M1

$= 10p^2 - 23pq - 42q^2$ A1

   (b) $(2x + 5)^2 - 3(7x - 1)$

$= \underbrace{4x^2 + 20x + 25}_{M1} - \underbrace{(21x + 3)}_{M1}$

$= 4x^2 - x + 28$ A1

6 (a) $\dfrac{\dfrac{2}{x} + \dfrac{4}{y}}{\dfrac{2}{x}}$

$= \dfrac{\dfrac{2y + 4x}{xy}}{\dfrac{2}{x}}$ M1

$= \dfrac{2y + 4x}{xy} \times \dfrac{x}{2}$

$= \dfrac{y + 2x}{y}$ A1

   (b) $\dfrac{3}{2x - 1} - \dfrac{5}{2 - 4x}$

$= \dfrac{3}{2x - 1} + \dfrac{5}{2(2x - 1)}$ M1

$= \dfrac{11}{2(2x - 1)}$ A1

7 (a) 2 cm : 3 km
       1 cm : 1.5 km   M1
       1 : 150 000   A1

   (b) 1 cm → 150 000 cm
       1 cm² → 150 000 × 150 000 cm²
              = 2.25 km²   M1
       5 cm² → 5 × 2.25
              = 11.25 km²   A1

8 $3x - 4y = 30$ (1)
     $2x - 7y = 33$ (2)
     (1) × 2, $6x - 8y = 60$ (3)
     (2) × 3, $6x - 21y = 99$ (4)   M1
     (4) − (3), $y = -3$ A1
     Sub. $y = -3$ into (1), $x = 6$ A1

9 (a) 1 111 111 111 − 22 222 = 33 333²   B1

   (b) $x = $ 1 111 111 111 111 111   B1
       $y = $ 22 222 222   B1

10 (a) $y = kx$
      when $y = 8$, $x = 16$
          $8 = 16k$
          $k = 0.5$ M1
          $y = 0.5x$ A1

   (b) $p = \dfrac{1}{2} \times 18$
        $= 9$ A1
      $24 = \dfrac{1}{2} \times q$
       $q = 48$ A1

Marking Scheme

11 Selling price of product $= \dfrac{100}{7} \times 686$ M1

$\qquad\qquad\qquad\qquad\quad = \$9\,800$ A1

12 $\dfrac{1.5}{2.4} = \dfrac{y}{3.2}$ M1

$\quad y = 2$ A1

$\quad \dfrac{1.5}{2.4} = \dfrac{x}{1.6}$

$\quad x = 1$ A1

13 (a) Scale factor $= \dfrac{10}{24}$

$\qquad\qquad\qquad = \dfrac{5}{12}$ A1

(b) Circumference of base of Cone Q

$\qquad = 84 \times \dfrac{5}{12}$ M1

$\qquad = 35$ cm   A1

14 (a) $F = \dfrac{4(27-9)}{3}$

$\qquad\quad = 24$ A1

(b) $80 = \dfrac{6(25-u)}{1.5}$

$\qquad 120 = 150 - 6u$ M1

$\qquad u = 5$ A1

15 (a) Pentagon   B1

(b) interior angle of pentagon

$\qquad = (5 - 2) \times 180$

$\qquad = 540$ M1

$\qquad x + x + 110 + 180 = 540$ M1

$\qquad x = 125$ A1

16 $2y = x$ (vert. opp angles)   M1

$\quad 2y + 2(2y) + 9y = 180$ (adj. angles on st. line)   M1

$\quad y = 12$ A1

$\quad x = 24$ A1

Candidate Name: _____

Class	Index Number

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MATHEMATICS

Part 2

Candidates answer on the Question Paper.
Additional Materials: 1 piece of graph paper

Date: 13 May 2008

Time: 1 hr 15 min

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Set by: Mr Leow Guan Sin

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1   Simplify $\dfrac{d^2-4}{d^2-3d+2} \div \dfrac{d}{d-1}$.   [3]

---

2   y is directly proportional to the cube of $(2x+1)$ and $y=3$ when $x=1$. Find

(a) y when $x=4$,   [3]
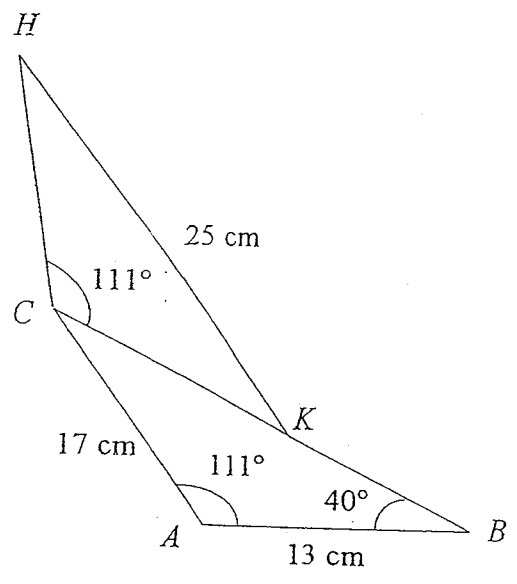
(b) x when $y=24$.   [2]

3   Given that $a = \sqrt{\dfrac{3b+c}{b-c}}$,

    (a) express c in terms of a and b,

    (b) find the value of c when $a = 3$ and $b = 5$.

[3]

[1]

4   In the diagram (not drawn to scale), $\triangle ABC$ and $\triangle CHK$ are congruent.
Given that $AB = 13$ cm, $AC = 17$ cm, $HK = 25$ cm, $\angle BAC = \angle HCK = 111°$ and $\angle ABC = 40°$,

    (a) find $\angle CKH$,

    (b) find the length of KB.

[1]

[2]

5   Factorise completely

    (a) $2a^2 + 2ab - a - b$,   [2]

    (b) $x^3 + 2x^2 - x - 2$.   [3]

6   In a factory, the technicians are paid \$70 per day and the packers \$40 per day. The total number of technicians and packers is 110 and their total wage bill per day is \$5 000. Form two simultaneous equations and use them to find the number of technicians and the number of packers in the factory.   [4]

7   A nature reserve has an area of 225 km^2.

   (a) A map has a scale of 1 cm to 5 km. Find the area of the nature reserve as represented on the map.
   [2]

   (b) On another map, the nature reserve is represented by an area of 36 cm^2. Express the scale of this map in the form $1 : r$.
   [3]

8   Given that $x + y = 4$, $x^2 + y^2 = 40$ and $x > y$,

   (a) calculate the value of $x - y$,
   [4]

   (b) hence, calculate the value of $x^2 - y^2$.
   [2]

9   In the diagram, DF is parallel to AC and DE is parallel to BC.
     $BD = 4$ cm, $AD = 8$ cm, $FC = 12$ cm and $AE = 16$cm.

   (a) Name a triangle that is congruent to triangle DEF.   [1]

   (b) Name a triangle that is similar to triangle BDF.   [1]

   (c) Find the length of BF.   [2]

   (d) Find the length of AC.   [2]
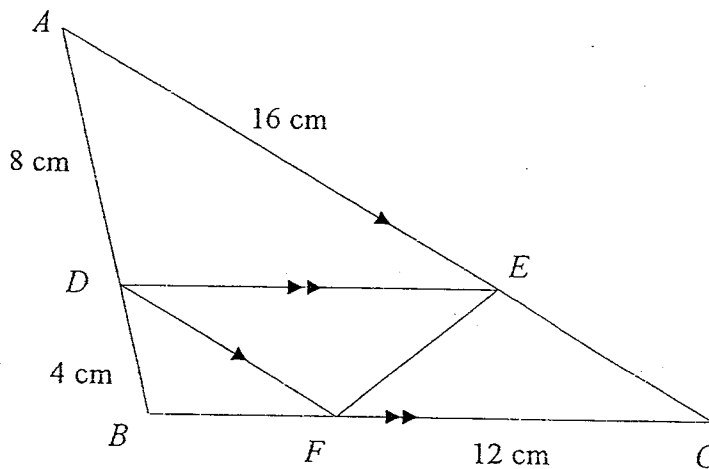
10 A contractor agreed to lay a road 3000 m long in 30 days. He employed 60 workers who worked for 8 hours a day. After 20 working days, he found that only 1800 m of the road was completed. How many more workers are to be employed in order to finish the remaining 1200 m of road in the next 10 days and if each worker now worked 10 hours a day? (Assume all the workers worked at the same rate.)

[4]

11 **Answer the whole of this question on a sheet of graph paper.**

Solve the following pair of simultaneous equations by the graphical method for $-6 \leq x \leq 6$.

$$4y + 3x = 18$$
$$2y - x = 4$$

Use a scale of 1 cm to 1 unit on both axes.

[5]

END OF PART 2

Marking Scheme

1
$$\frac{d^2-4}{d^2-3d+2} \div \frac{d}{d-1}$$

$$= \frac{(d-2)(d+2)}{(d-2)(d-1)} \times \frac{d-1}{d} \qquad \text{M1}$$
$$\qquad\qquad\qquad\qquad \text{M1}$$

$$= \frac{d+2}{d} \qquad\qquad\qquad\qquad \text{A1}$$

2 (a) $y = k(2x+1)^3$ M1
when $y = 3$, $x = 1$
$3 = k[2(1)+1]^3$
$k = \dfrac{1}{9}$ M1

when $x = 4$, $y = \dfrac{1}{9}[2(4)+1]^3$
$\qquad\qquad = 81$ A1

(b) when $y = 24$, $24 = \dfrac{1}{9}(2x+1)^3$
$\qquad\qquad 2x+1 = \sqrt[3]{216}$ M1
$\qquad\qquad x = 2.5$ A1

3 (a) $a^2 = \dfrac{3b+c}{b-c}$ M1
$a^2 b - a^2 c = 3b + c$
$c(a^2+1) = b(a^2-3)$ M1
$c = \dfrac{b(a^2-3)}{a^2+1}$ A1

(b) $c = \dfrac{5(3^2-3)}{3^2+1}$
$\qquad = 3$ A1

4 (a) $\angle CKH = \angle ACB$ (corr. $\angle$ of $\equiv \triangle$)
$\qquad\qquad = 180° - 40° - 111°$
$\qquad\qquad = 29°$ A1

(b) $BC = HK$ (corr. sides of $\equiv \triangle$)
$\qquad = 25$ cm
$CK = AC$ (corr. sides of $\equiv \triangle$)   M1
$\qquad = 17$ cm
$KB = 25 - 17$
$\qquad = 8$ cm   A1

5 (a) $2a^2 + 2ab - a - b$
$= 2a(a+b) - (a+b)$ M1
$= (a+b)(2a-1)$ A1

(b) $x^3 + 2x^2 - x - 2$
$= x^2(x+2) - (x+2)$ M1
$= (x+2)(x^2-1)$ M1
$= (x+2)(x-1)(x+1)$ A1

6 Let x be the number of technicians and y be the number of packers.

$x + y = 110$ (1)   M1
$70x + 40y = 5000$ (2)
From (2), $7x + 4y = 500$ (3)   M1
(1) $\times$ 4, $4x + 4y = 440$ (4)
(3) $-$ (4), $x = 20$ A1
Sub. $x = 20$ into (1), $y = 90$ A1

There are 20 technicians and 90 packers.

7 (a) 1 cm $\rightarrow$ 5 km
1 cm^2 $\rightarrow$ 25 km^2 M1
Area of nature reserve = 225/25
$\qquad\qquad\qquad\quad = 9$ cm^2 A1

(b) 36 cm^2 $\rightarrow$ 225 km^2
1 cm^2 $\rightarrow$ 6.25 km^2 M1
1 cm $\rightarrow$ $\sqrt{6.25}$ km   M1
$\qquad\quad = 2.5$ km
1 : 250 000   A1

8 (a) $(x^2 + y^2) = 16$ M1
$x^2 + 2xy + y^2 = 16$
$2xy = 16 - 40$
$\qquad = -24$ M1
$(x^2 - y^2) = x^2 - 2xy + y^2$
$\qquad\qquad = 40 - (-24)$ M1
$x - y = 8$ or -8 (reject)   A1

(b) $x^2 - y^2 = (x+y)(x-y)$
$\qquad\qquad = 4 \times 8$ M1
$\qquad\qquad = 32$ A1

Marking Scheme

9   (a) $\triangle CFE$ B1

    (b) $\triangle BAC$ or $\triangle DAE$ B1

    (c) Let x be the length of BF,

$$\frac{4}{12} = \frac{x}{x+12}$$ M1

$$x = 6 \text{ cm}$$ A1

    (d) Let y be the length of AC,

$$\frac{8}{12} = \frac{16}{y}$$ M1

$$y = 24 \text{ cm}$$ A1

10 Number of men needed

$$= \frac{20}{10} \times \frac{1200}{1800} \times \frac{8}{10} \times 60$$

     ↓   ↓   ↓

  M1 M1   M1

$$= 64$$

Additional men needed $= 64 - 60$

$$= 4$$ A1