

Visit
FREETESTPAPER.com
for more papers



Website: freetestpaper.com



[Facebook.com/freetestpaper](https://www.facebook.com/freetestpaper)



[Twitter.com/freetestpaper](https://twitter.com/freetestpaper)



BEATTY SECONDARY SCHOOL
END-OF-YEAREXAMINATION 2014

SUBJECT : Mathematics

LEVEL : Sec 2 Express

PAPER : 1

DURATION : 1 hour 15 minutes

SETTER : Mr Cheong Boon Wee

DATE : 3 October 2014

CLASS :	NAME :	REG NO :
---------	--------	----------

.....
READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces on the top of this page.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

If working is needed for any question, it must be shown with the answer.

Omission of essential working will result in loss of marks.

You are expected to use a scientific calculator to evaluate explicit numerical expressions.

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 .

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 **50**.

For Examiner's Use
50

This paper consists of **11** printed pages (including this cover page)

[Turn over

Answer **all** the questions.

*For
Examiner's
Use*

- 1 (a) Simplify $4a^2 - (2a + 5)(2a - 5) + a$.

Answer : (a) _____ [2]

- (b) Express $\frac{1}{4m^2 - 16m - 20} + \frac{m}{m - 5}$ as a fraction in its simplest form.

Answer : (b) _____ [3]

2 Expand and simplify

(a) $(2m + 3)(m - 2) - (m + 4)(m - 3)$.

Answer : (a) _____ [3]

(b) Hence, solve the equation $(2m + 3)(m - 2) - (m + 4)(m - 3) = 21$

Answer : (b) $m =$ _____ [3]

[Turn over

- 3 Solve the simultaneous equations.

$$\frac{3x+y}{11} = \frac{1}{2}$$

$$x+y=3$$

*For
Examiner's
Use*

Answer : $x=$ _____
 $y=$ _____ [3]

- 4 (a) Factorise $4b^2 - 4c^2$.

For
Examiner's
Use

Answer : (a) _____ [2]

- (b) Given that $4b^2 - 4c^2 = 224$, $b + c = 7$ and $bc = -\frac{15}{4}$,

- (i) find the value of $b - c$,

Answer : (b)(i) _____ [1]

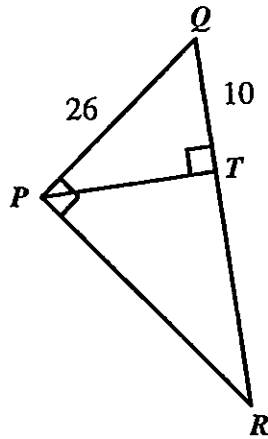
- (ii) find the value of $b^2 + c^2$.

Answer : (b)(ii) _____ [2]

[Turn over

- 5 In the diagram, triangle PQR is similar to triangle TQP .
 $PQ = 26$ cm, $QT = 10$ cm, $\angle QPR = 90^\circ$ and $\angle PTQ = 90^\circ$.

For
Examiner's
Use



- (a) Calculate PT .

Answer: (a) $PT =$ _____ cm [2]

- (b) Calculate $\angle QPT$.

Answer: (b) $\angle QPT =$ _____ $^\circ$ [2]

- (c) Calculate PR .

Answer: (c) $PR =$ _____ cm [2]

- 6 The time needed to complete a project is inversely proportional to the number of students involved.

5 students can complete the project in 9 hours.

- (a) Calculate the number of students needed to complete the project in 3 hours.

*For
Examiner's
Use*

Answer : (a) _____ [2]

- (b) Calculate the time taken for 8 students to complete the project.
Leave your answer to the nearest minute.

Answer : (b) _____ minutes [2]

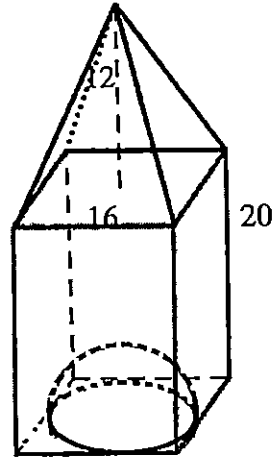
[Turn over

- 7 A solid pyramid has a square base of side 16 cm and height 12 cm.
A cuboid has a square base of side 16 cm and height 20 cm.
A metal toy is made by attaching the bases of the pyramid and the cuboid.
A hemisphere of diameter 16 cm is then carved out from the bottom of the cuboid.

[Surface area of a sphere = $4\pi r^2$]

[Volume of a sphere = $\frac{4}{3}\pi r^3$]

- (a) Calculate the volume of the toy.



Answer : (a) Volume = _____ cm^3 [3]

- (b) Calculate the surface area of the toy.

Answer : (b) Surface Area = _____ cm^2 [4]

8

In a bag, there are 32 red balls and some yellow balls.
 The probability that one yellow ball is chosen at random is $\frac{5}{13}$.

*For
Examiner's
Use*

- (a) Find the probability that one red ball is chosen at random.

Answer : (a) _____ [1]

- (b) Find the total number of red and yellow balls in the bag.

Answer : (b) _____ [1]

- (c) $(x-3)$ yellow balls are removed from the bag.

The new probability that one yellow ball is chosen at random is $\frac{1}{3}$.

Find the value of x .

Answer : (c) $x =$ _____ [2]

[Turn over

- 9 A survey was carried out to find the number of minutes spent on computer games in a day by a group of students.
The result of this survey is shown in the frequency table below.

For
Examiner's
Use

Number of minutes (n minutes)	Frequency (f)
$0 \leq n < 20$	15
$20 \leq n < 40$	8
$40 \leq n < 60$	34
$60 \leq n < 80$	23

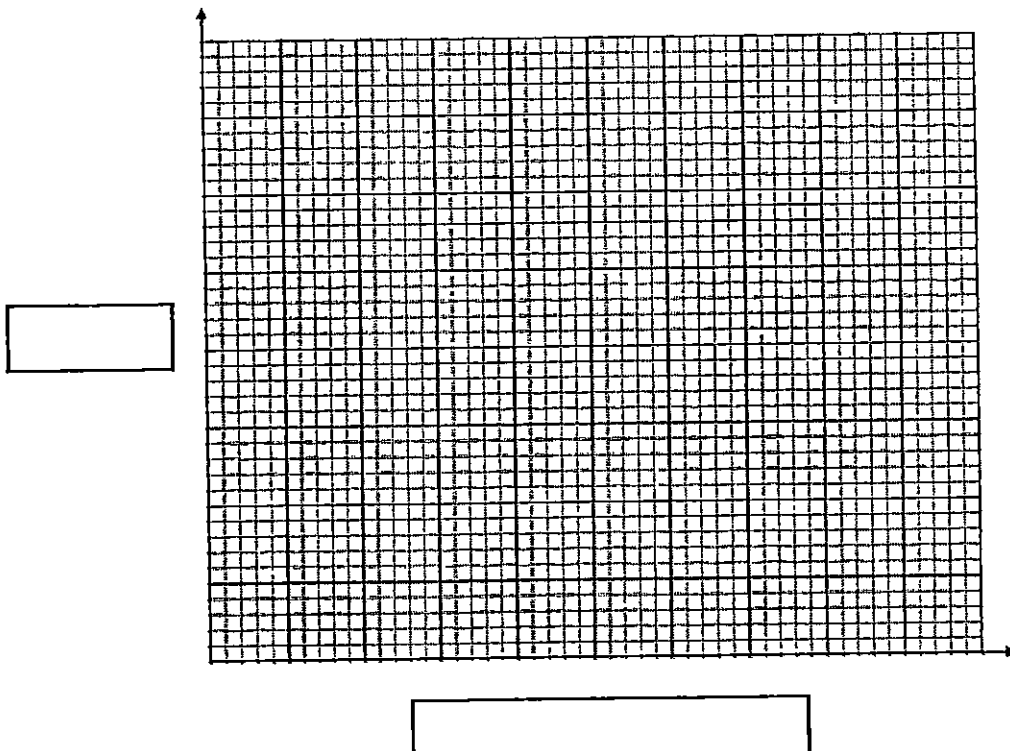
- (a) Calculate the total number of students surveyed.

Answer : (a) _____ [1]

- (b) Find the mean time spent on playing computer games.

Answer : (b) _____ minutes [2]

- (c) Draw a histogram on the grids below to illustrate the information.
You are required to label the axes clearly.



[3]

- 10 Ten boys and ten girls recorded their total walking distance in one week.

The results are shown in the stem-and-leaf diagram.

Boys				Girls		
4	3	2	1	7	8	
	2	3	2	4	5	5
5	5	4				
8	8	5	4	5	8	
6	4	6				

Key (Boys)

3 | 2 means 23 km

Key (Girls)

2 | 1 means 21 km

- (a) Write down the median distance of the boys.

Answer : (a) _____ km [1]

- (b) Write down the mode of the boys and girls.

Answer : (b) _____ km [1]

- (c) If one more girl is included into the data, the mean distance of the girls will be 38. Calculate the distance travelled by this girl.

Answer : (c) _____ km [2]

~End of Paper~

Answers

1(a) $a + 25$

1(b) $\frac{(1+2m)^2}{8m^2-36m-20}$

2(a) $m^2 - 2m + 6$

2(b) $m = 5$ or $m = -3$

3 $x = \frac{5}{4}, y = \frac{7}{4}$

4(a) $4(b+c)(b-c)$

4(b)
(i) 224

(ii) $\frac{113}{2}$

5(a) 24

5(b) 22.6°

5(c) 62.4 cm

6(a) 338

6(b) 15

7(a) 5070

7(b) 2200

8(a) $\frac{8}{13}$

8(b) 52

8(c) 7

9(a) $46\frac{1}{4}$

9(b) $46\frac{1}{4}$

10(a) 48.5

10(b) 58

10(c) 39

Answer all the questions.

1 (a) Simplify $4a^2 - (2a + 5)(2a - 5) + a$.

$$= 4a^2 - (4a^2 - 25) + a \quad [\text{M1}]$$

$$= a + 25 \quad [\text{A1}]$$

Answer : (a) $a + 25$ [2]

(b) Express $\frac{1}{4m^2 - 16m - 20} + \frac{m}{m - 5}$ as a fraction in its simplest form.

$$= \frac{1}{4(m^2 - 4m - 5)} + \frac{m}{m - 5}$$

$$= \frac{1}{4(m - 5)(m + 1)} + \frac{m}{m - 5} \quad [\text{M1}]$$

$$= \frac{4m(m + 1) + 1}{4(m - 5)(m + 1)} \quad [\text{M1}]$$

$$= \frac{4m^2 + 4m + 1}{4(m - 5)(m + 1)} \quad [\text{A1}]$$

or

$$\frac{(1 + 2m)^2}{4(m - 5)(m + 1)}$$

Answer : (b) $\frac{(1 + 2m)^2}{4(m - 5)(m + 1)}$ [3]

2 Expand and simplify

(a) $(2m+3)(m-2)-(m+4)(m-3).$

$$= (2m^2 - 4m + 3m - 6) - (m^2 + m - 12) \quad [\text{M1} - \text{expansion}]$$

$$= 2m^2 - 4m + 3m - 6 - m^2 - m + 12 \quad [\text{M1} - \text{correct removal of brackets}]$$

$$= m^2 - 2m + 6 \quad [\text{A1}]$$

$$\text{Answer : (a) } \underline{m^2 - 2m + 6} \quad [3]$$

(b) Hence, solve the equation $(2m+3)(m-2)-(m+4)(m-3)=21$

$$m^2 - 2m + 6 = 21$$

$$m^2 - 2m - 15 = 0 \quad [\text{M1}]$$

$$(m-5)(m+3)=0 \quad [\text{M1} - \text{correct factorisation}]$$

$$m=5 \text{ or } m=-3 \quad [\text{A1}]$$

$$\text{Answer : (b) } m = \underline{m=5 \text{ or } m=-3} \quad [3]$$

3 Solve the simultaneous equations.

$$\frac{3x+y}{11} = \frac{1}{2} \text{ -----(1)}$$

$$x+y=3 \text{ -----(2)}$$

From (2): $x=3-y \text{ -----(3)}$

Sub (3) into (1): $\frac{3(3-y)+y}{11} = \frac{1}{2}$
 $\frac{9-3y+y}{11} = \frac{1}{2}$ [M1 – substitution / elimination method]

$$\frac{9-2y}{11} = \frac{1}{2}$$

$$9-2y = \frac{11}{2}$$

$$y = \frac{7}{4} \text{ [A1]}$$

Sub $y = \frac{7}{4}$ into (3): $x = 3 - \frac{7}{4} = \frac{5}{4}$ [A1]

Answer : $x = \frac{5}{4}$
 $y = \frac{7}{4}$ [3]

4 (a) Factorise $4b^2 - 4c^2$.

$$= 4(b^2 - c^2) \quad [\text{M1}]$$

$$= 4(b+c)(b-c) \quad [\text{A1}]$$

$$\text{Answer: (a)} \quad 4b^2 - 4c^2 = \underline{4(b+c)(b-c)} \quad [2]$$

(b) Given that $4b^2 - 4c^2 = 224$, $b+c=7$ and $bc = -\frac{15}{4}$,

(i) find the value of $b-c$,

$$4(7)(b-c) = 224$$

$$b-c = 8 \quad [\text{B1}]$$

$$\text{Answer: (b)(i)} \quad b-c = \underline{8} \quad [1]$$

(ii) find the value of $b^2 + c^2$.

$$(b+c)^2 = b^2 + 2bc + c^2$$

$$7^2 = b^2 + c^2 - 2\left(-\frac{15}{4}\right) \quad [\text{M1}]$$

$$b^2 + c^2 = 49 + \frac{15}{2}$$

$$= \frac{113}{2} \quad [\text{A1}]$$

or

$$(b-c)^2 = b^2 - 2bc + c^2$$

$$8^2 = b^2 + c^2 - 2\left(-\frac{15}{4}\right) \quad [\text{M1}]$$

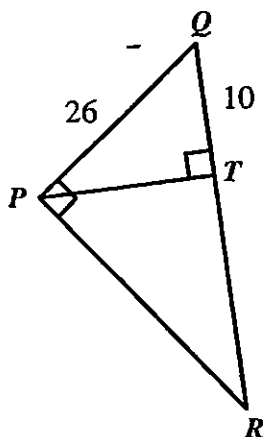
$$b^2 + c^2 = 64 - \frac{15}{2}$$

$$= \frac{113}{2} \quad [\text{A1}]$$

$$\text{Answer: (b)(ii)} \quad b^2 + c^2 = \underline{\frac{113}{2}} \quad [2]$$

- 5 In the diagram, triangle PQR is similar to triangle TQP .

$PQ = 26$ cm, $QT = 10$ cm, $\angle QPR = 90^\circ$ and $\angle PTQ = 90^\circ$.



- (a) Calculate PT .

By Pythagoras' Theorem

$$PT = \sqrt{26^2 - 10^2} \quad [\text{M1}]$$

$$= 24 \quad [\text{A1}]$$

Answer: (a) $PT =$ 24 cm [2]

- (b) Calculate $\angle QPT$.

$$\sin \angle QPT = \frac{10}{26} \quad [\text{M1} - \text{can use other basic trigo ratios}]$$

$$\angle QPT = \sin^{-1}\left(\frac{10}{26}\right)$$

$$= 22.6^\circ \text{ (1 d.p.)} \quad [\text{A1}]$$

Answer: (b) $\angle QPT =$ 22.6 $^\circ$ [2]

- (c) Calculate PR .

$$\frac{PR}{24} = \frac{26}{10} \quad [\text{M1} \checkmark - \text{or alternative methods}]$$

$$PR = \frac{26}{10} \times 24$$

$$= 62.4 \text{ cm} \quad [\text{A1}]$$

Answer: (c) $PR =$ 62.4 cm [2]

- 6 The time needed to complete a project is inversely proportional to the number of students involved.

5 students can complete the project in 9 hours.

- (a) Calculate the number of students needed to complete the project in hours.

Let t be the time taken in hours, and s be the number of students.

$t = \frac{k}{s}$, where k is a constant.

$$9 = \frac{k}{5} \quad [\text{M1}]$$

$$k = 45$$

$$t = \frac{45}{s}$$

When $t = 3$

$$3 = \frac{45}{s} \quad [\text{M1}]$$

$$s = 15 \quad [\text{A1}]$$

Answer : (a) 15 [3]

- (b) Calculate the time taken for 8 students to complete the project.

Leave your answer to the nearest minute

When $s = 8$,

$$t = \frac{45}{8} \quad [\text{M1}]$$

$$t = 5.625 \text{ hours}$$

$$t = 5.625 \times 60$$

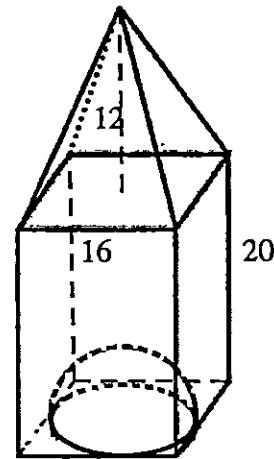
$$= 338 \text{ minutes (3 s.f.)} \quad [\text{A1}]$$

Answer : (b) 338 minutes [2]

- 7 A solid pyramid has a square base of side 16 cm and height 12 cm.

A cuboid has a square base of side 16 cm.

A metal toy is made by attaching the bases of the pyramid and the cuboid. A hemisphere of diameter 16 cm is then carved out of the cuboid.



$$[\text{ Surface area of a sphere} = 4\pi r^2]$$

$$[\text{ Volume of a sphere} = \frac{4}{3}\pi r^3]$$

- (a) Calculate the volume of the toy.

$$\begin{aligned} \text{Volume of pyramid} &= \frac{1}{3} \times 16^2 \times 12 \\ &= 1024 \text{ cm}^3 \quad [\text{M1}] \end{aligned}$$

$$\begin{aligned} \text{Volume of cuboid} &= 16^2 \times 20 \\ &= 5120 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Volume of hemisphere} &= \frac{1}{2} \left(\frac{4}{3} \pi \times 8^3 \right) \quad [\text{M1}] \\ &= 341\frac{1}{3} \pi \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Volume of toy} &= 1024 + 5120 - 341\frac{1}{3} \pi \\ &= 5070 \text{ cm}^3 \text{ (3 s.f.)} \quad [\text{A1}] \end{aligned}$$

Answer : (a) Volume = 5070 cm³ [3]

- (b) Calculate the surface area of the toy.

$$\begin{aligned} \text{Surface area of slant faces} &= 4 \times \left(16 \times \sqrt{12^2 + 8^2} \times \frac{1}{2} \right) \quad [\text{M1}] \\ &= 461.510 \text{ cm}^2 \end{aligned}$$

Surface area of rectangular faces and base of cuboid (carved)

$$\begin{aligned} &= [4 \times (16 \times 20)] + (16^2 - 8^2 \times \pi) + \frac{1}{2} [4\pi \times 8^2] \quad [\text{M1}] \\ &= 1737.0619 \text{ cm}^2 \quad [\text{M1} - \text{interior curved surface of hemisphere}] \end{aligned}$$

Total surface area

$$\begin{aligned} &= 461.510 + 1737.0619 \\ &= 2198.57 \\ &= 2200 \text{ cm}^2 \text{ (3 s.f.)} \quad [\text{A1}] \end{aligned}$$

Answer : (b) Surface Area = 2200 cm² [4]

8 In a bag, there are 32 red balls and some yellow balls.

The probability that one yellow ball is chosen is $\frac{5}{13}$.

(a) Find the probability that one red ball is chosen at random.

$$\begin{aligned} P(\text{red ball}) &= 1 - \frac{5}{13} \\ &= \frac{8}{13} \quad [\text{B1}] \end{aligned}$$

Answer : (a) $\frac{8}{13}$ [1]

(b) Find the total number of red and yellow balls in the bag.

Number of yellow balls

$$= 32 \times \left(\frac{5}{13} \div \frac{8}{13} \right)$$

$$= 32 \times \frac{5}{8}$$

$$= 20$$

Total red & yellow balls or

$$= 32 + 20$$

$$= 52 \quad [\text{B1}]$$

$$8 \text{ units} = 32 \text{ balls}$$

$$13 \text{ units} = 13 \times \frac{32}{8}$$

$$= 52 \text{ balls} \quad [\text{B1}]$$

Answer : (b) 52 [1]

- (c) $(x-3)$ yellow balls are removed from the bag.
 The new probability that one yellow ball is chosen is $\frac{1}{3}$.
 Find the value of x .

$$\begin{aligned} n(S) &= 52 - (x-3) \\ &= 55 - x \end{aligned}$$

$$\begin{aligned} n(\text{yellow balls}) &= 20 - (x-3) \\ &= 23 - x \end{aligned}$$

$$\frac{23-x}{55-x} = \frac{1}{3} \quad [\text{M1}]$$

$$69 - 3x = 55 - x$$

$$2x = 14$$

$$x = 7 \quad [\text{A1}]$$

$$P(\text{red balls}) = \frac{2}{3}$$

$$2 \text{ units} = 32 \text{ balls}$$

$$1 \text{ unit} = 16 \text{ balls}$$

Number of yellow balls removed

$$= 20 - 16 \quad [\text{M1}]$$

$$= 4$$

$$x - 3 = 4$$

$$x = 7 \quad [\text{A1}]$$

Answer : (c) $x = \underline{\quad 7 \quad}$ [2]

- 9 A survey was carried out to find the number of minutes spent on computer games in a day by a group of students.
 The result of this survey is shown in the frequency table below.

Number of minutes (n minutes)	Frequency (f)
$0 \leq n < 20$	15
$20 \leq n < 40$	8
$40 \leq n < 60$	34
$60 \leq n < 80$	23

- (a) Calculate the total number of students surveyed.
 $= 15 + 8 + 34 + 23$
 $= 80 \quad [\text{B1}]$

Answer : (a) $\underline{\quad 80 \quad}$ [1]

- (b) Find the mean time spent on playing computer games.

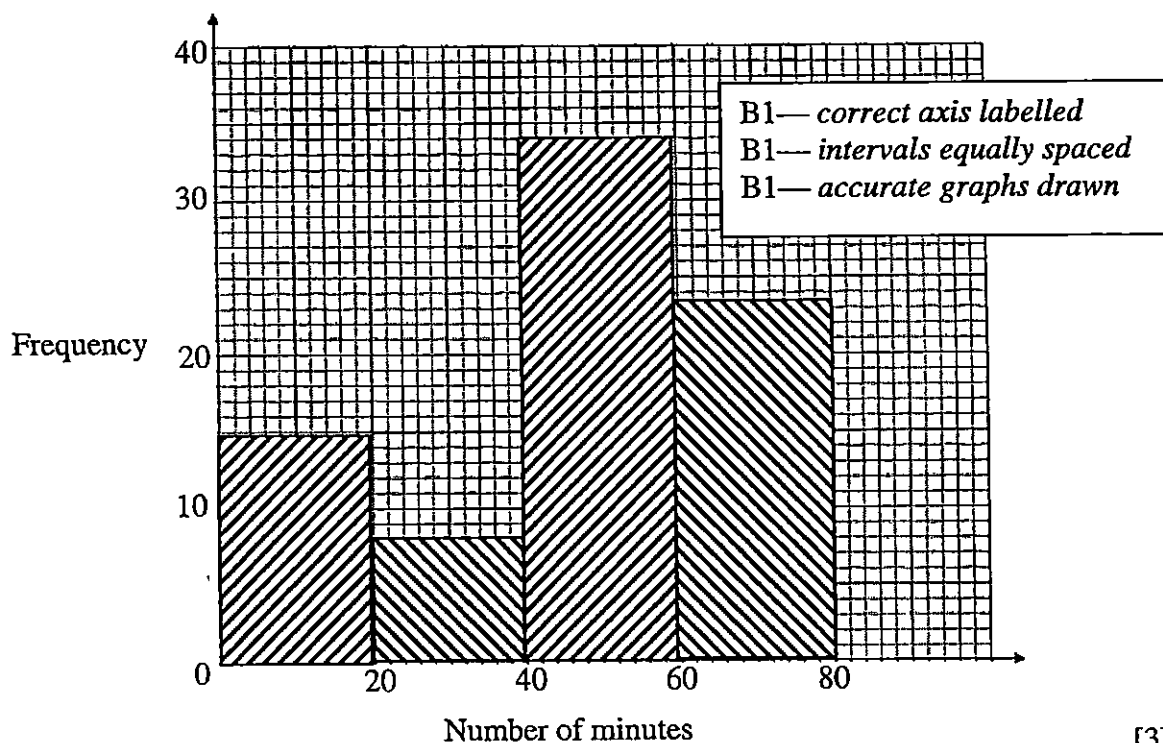
Mid-value (n)	(f)
10	15
30	8
50	34
70	23

$$\text{Mean} = \frac{10(15) + 30(8) + 50(34) + 70(23)}{80} \quad [\text{M1}]$$

$$= 46.25 \text{ or } 46\frac{1}{4} \text{ minutes} \quad [\text{A1}]$$

Answer : (b) $\underline{\quad 46\frac{1}{4} \quad}$ minutes [2]

(c) Draw a histogram on the grids below to illustrate the information.



[3]

- 10 Ten boys and ten girls recorded their total walking distance in one week.

The results are shown in the stem-and-leaf diagram.

Boys				Girls		
4	3	2	1	7	8	
	2	3	2	4	5	5
5	5	4				
8	8	5	4	5	8	
6	4	6				

Key (Boys)

3 | 2 means 23 km

Key (Girls)

2 | 1 means 21 km

- (a) Write down the median distance of the boys.

23,24,32,45,45,52,58,58,64,66

$$\frac{45+52}{2} = 48.5 \quad [\text{B1}]$$

Answer: (a) 48.5 km [1]

- (b) Write down the mode of the boys and girls.

58 [B1]

Answer : (b) 58 km [1]

- (c) If one more girl is included into the data, the mean distance of the girls will be 38. Calculate the distance travelled by this girl.

Let x be the distance travelled by the girl.

Using mean,

$$\frac{21+27+28+32+34+35+35+54+55+58+x}{11} = 38 \quad [\text{M1}]$$

$$\frac{379+x}{11} = 38$$

$$x = 418 - 379$$

$$x = 39 \quad [\text{A1}]$$

Answer : (c) 39 km [2]

~End of Paper~



**BEATTY SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2014**

SUBJECT : Mathematics

LEVEL : Sec 2 Express

PAPER : 2

DURATION : 1 hour 30 minutes

SETTER : Mdm See Huey Yi

DATE : 09 Oct 2014

CLASS :	NAME :	REG NO :
----------------	---------------	-----------------

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces on the top of this page.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

If working is needed for any question, it must be shown with the answer.

Omission of essential working will result in loss of marks.

Calculators should be used where appropriate.

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 .

At the end of the examination, fasten all your work securely together.

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 50.

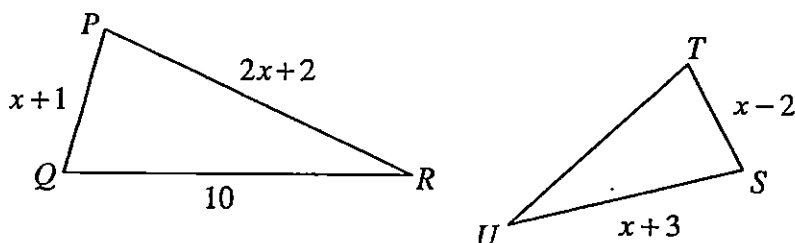
This paper consists of 6 printed pages (including this cover page)

[Turn Over

- 1 (a) The scale of map X is 1 cm : 0.2 km and the scale of map Y is 1 : 50 000.
Given that the area of a park on map X is 5.5 cm^2 , find the area, in cm^2 , of the same park on map Y . [3]
- (b) p is directly proportional to the square of q . It is known that $p = 14$ for a particular value of q . When q is increased to 200%, find the percentage increase in p . [3]
- 2 (a) Expand $2(3x - 5)(-x + 4)$. [2]
- (b) Express $\frac{x-2}{4x^2-9} \div \frac{3x^2-4x-4}{2x-3}$ in its simplest form. [3]
- (c) Given that $\frac{2a}{5} = \frac{b}{4} + \frac{3}{bc^2}$, make c the subject of the formula. [3]
- 3 (5, -1) and (-2, 6) are 2 points on a linear function $py = qx - 2$.
- (a) Form a pair of simultaneous equations to represent the above information and show that the equations can be simplified to
- $$\begin{aligned} p + 5q &= 2 \\ 3p + q &= -1 \end{aligned}$$
- [2]
- (b) Solve the simultaneous equations in part (a). [3]

- 4 In the figure below, ΔPQR is similar to ΔSTU .

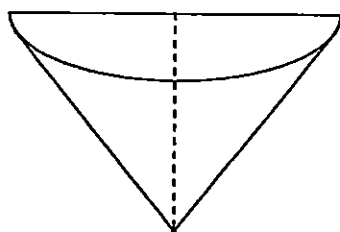
It is given that $PQ = (x+1)$ cm, $PR = (2x+2)$ cm, $QR = 10$ cm, $US = (x+3)$ cm and $TS = (x-2)$ cm.



- (a) Form an equation in terms of x and show that it reduces to $x^2 - 6x - 7 = 0$. [2]
- (b) Solve $x^2 - 6x - 7 = 0$. [2]
- (c) Hence, find the perimeter of ΔPQR . [1]
- 5 The figure shows a semicircular solid cone. The radius of the base is half its slant height. The curved surface area of the semicircular cone is 36.8 cm^2 .

[Curved surface area of cone = πrl]

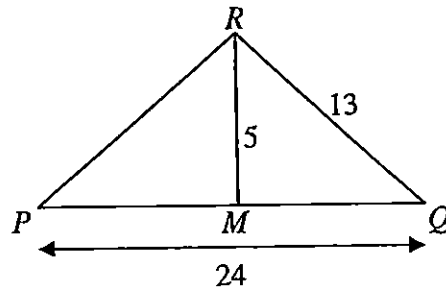
[Volume of cone = $\frac{1}{3}\pi r^2 h$]



- (a) Find the radius of the semicircular cone. [2]
- (b) Hence, find the volume of the semicircular cone. [3]

[Turn Over

- 6 (a) The diagram shows a triangle PQR where $QR = 13$ cm and $PQ = 24$ cm. M is the midpoint of PQ and $RM = 5$ cm.



- (i) Show that $\triangle RMQ$ is a right-angled triangle. [2]
- (ii) Calculate $\angle PRQ$. [2]
- (b) A 3-digit number is formed at random using the digits 1, 3 and 6 without repetition of the digits.
- (i) Write down the sample space. [1]
- (ii) Find the probability that the 3-digit number formed is greater than 700. [1]
- (iii) Find the probability that the 3-digit number formed is an even number. [1]

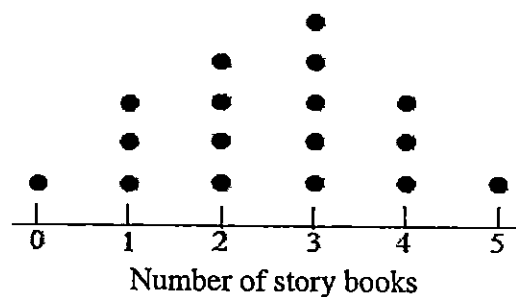
- 7 (a) A survey was conducted to find the number of hours a group of students spend on surfing the internet on a particular day. The results are shown in the table below.

Number of hours	1	2	3	4	5	6
Number of students	2	11	x	5	8	4

If the median is 3, find the smallest possible value of x .

[1]

- (b) The dot diagram shows the number of story books read by a group of students in a particular week.



- (i) Find the modal number of story books read. [1]
- (ii) Find the mean number of story books read. [2]
- (iii) If two students are removed from the group, the mean number of story books read is 2.4. Calculate the total number of story books these two students read. [2]

[Turn Over]

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

The table below gives some values of x and the corresponding values of y , where $y = -2x^2 - x + 6$.

x	-3	-2	-1	0	1	2	3
y	-9	a	5	6	3	-4	-15

- (a) Find the value of a . [1]
- (b) Using a scale of 2 cm to represent 1 unit on the x -axis and 1 cm to represent 1 unit on the y -axis, draw the graph of $y = -2x^2 - x + 6$ for $-3 \leq x \leq 3$. [3]
- (c) Use your graph to
- (i) find the coordinates of the turning point, [1]
- (ii) find the equation of the line of symmetry, [1]
- (iii) find the negative value of x when $y = 4$, [1]
- (iv) solve $2x^2 + x - 6 = 0$. [1]

~ End of Paper ~

Answer (BTY EOY 2E(P2) 2014

1(a) 0.88 cm^2

(b) 300%

2(a) $-6x^2 + 34x - 40$

(b) $\frac{1}{(2x+3)(3x+2)}$

(c) $c = \pm \sqrt{\frac{60}{b(8a-5b)}} \quad \text{or} \quad c = \pm \sqrt{\frac{60}{8ab-5b^2}}$

3(a) $p(-1) = q(5) - 2$

$p(6) = q(-2) - 2$

(b) $p = -0.5 \text{ and } q = 0.5$

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

(b) $x = -1 \text{ or } 7$

(c) 34 cm

5(a) 3.42 cm

(b) 36.4 cm^3

6(a) 134.8°

(b) $\{136, 163, 316, 361, 613, 631\}$

(bii) 0

(biii) $\frac{1}{3}$

7(a) 5

(b) 3

(bii) $2\frac{9}{17} \text{ or } 2.53$

(biii) 7

8(a) 0

(ci) $(-0.25, 6.2)$ [Note : $-0.3 \leq x \leq -0.2$, $6.1 \leq y \leq 6.3$]

(cii) $x = -0.25$

(ciii) $x = -1.3 (\pm 0.1)$

(civ) $x = -2 \text{ or } x = 1.5 (\pm 0.1)$

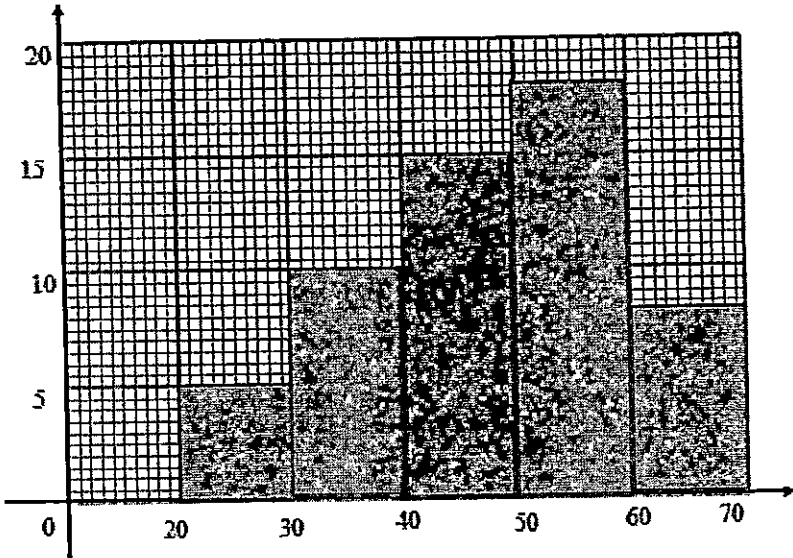
[Turn Over

Marking Scheme

[illegible]

No	Working	Allocation of Marks
5(a)	$0.9 + 0.25x \leq 5$ or $90 + 25x \leq 500$	B1
5(b)	$0.9 + 0.25x \leq 5$ or $90 + 25x \leq 500$ $x \leq \frac{5 - 0.90}{0.25}$ $x \leq \frac{500 - 90}{25}$ $x \leq 16.4$ $x \leq 16.4$	B1
5(c)	Maximum words = 16	B1 / FT1
6	$p = \sqrt{\frac{w}{2w - 3x}}$ $p^2 = \frac{w}{2w - 3x}$ $p^2(2w - 3x) = w$ $2p^2w - 3p^2x = w$ $2p^2w - w = 3p^2x$ $w(2p^2 - 1) = 3p^2x$ $w = \frac{3p^2x}{2p^2 - 1}$	M1 remove square root M1 Factorize w A1
7(a)	$9x + 4 = 3x - (7 - 2x)$ $9x + 4 = 3x - 7 + 2x$ $9x - 3x - 2x = -7 - 4$ $4x = -11$ $x = -\frac{11}{4}$ or -3.25	M1 remove bracket correctly (+ x) A1
7(b)	$(z - 6)^2 = 121$ $z - 6 = \pm\sqrt{121}$ $z - 6 = 11$ or $z - 6 = -11$ $z = 17$ or $z = -5$ Or $(z - 6)^2 = 121$ $z^2 - 12z + 36 = 121$ $z^2 - 12z - 85 = 0$ $(z - 17)(z + 5) = 0$ $z = 17$ or $z = -5$	M1 (square root) A1 (for both answers) M1 (Factorization) / expand and simplify A1 (both answers)
8a	1 : 600 000 1 cm represent 6 km 8 cm represent 48 km.	B1
8b	1 cm represent 6 km 1 cm ² represent 36 km ² 36 km ² represent 1 cm ² 900 km ² represent $\frac{1}{36} \times 900 = 25$ cm ²	M1 (Area scale) A1

No	Working	Allocation of Marks																		
9	$2(x-y)^2 = 128$ and $xy = 20$ $(x-y)^2 = 64$ $x^2 - 2xy + y^2 = 64$ $x^2 + y^2 = 64 + 2(20)$ $x^2 + y^2 = 104$ $(x+y)^2 = 104 + 2(20)$ $(x+y)^2 = 144$ $5(x+y)^2 = 720$	 M1 find $x^2 + y^2$ value M1 for $(x+y)^2$ A1																		
10	Height of tree + Height of cliff = x Height of Cliff = h $\tan 58^\circ = \frac{x}{85}$ $x = \tan 58^\circ \times 85$ $\tan 43^\circ = \frac{h}{85}$ $h = \tan 43^\circ \times 85$ Height of tree = $\tan 58^\circ \times 85 - \tan 43^\circ \times 85$ = 56.8 m (3 s.f.)	 M1 (Use tangent ratio to find either height of cliff or height of cliff and tree) M1 A1																		
11(a)	<table border="1"> <thead> <tr> <th>Masses (m) in grams</th><th>Mid-value</th><th>Frequency, f</th></tr> </thead> <tbody> <tr> <td>$20 < m \leq 30$</td><td>25</td><td>5</td></tr> <tr> <td>$30 < m \leq 40$</td><td>35</td><td>10</td></tr> <tr> <td>$40 < m \leq 50$</td><td>45</td><td>15</td></tr> <tr> <td>$50 < m \leq 60$</td><td>55</td><td>18</td></tr> <tr> <td>$60 < m \leq 70$</td><td>65</td><td>7</td></tr> </tbody> </table>	Masses (m) in grams	Mid-value	Frequency, f	$20 < m \leq 30$	25	5	$30 < m \leq 40$	35	10	$40 < m \leq 50$	45	15	$50 < m \leq 60$	55	18	$60 < m \leq 70$	65	7	 B1 for all values to be correct
Masses (m) in grams	Mid-value	Frequency, f																		
$20 < m \leq 30$	25	5																		
$30 < m \leq 40$	35	10																		
$40 < m \leq 50$	45	15																		
$50 < m \leq 60$	55	18																		
$60 < m \leq 70$	65	7																		
11(b)	Frequency Mass (m) in grams	 Labelling of axis correctly B1 Draw the bars correctly B1 Minus 1 for any error																		

No	Working	Allocation of Marks
11b	Alternative drawing Frequency  Mass (m) in grams	Labelling of axis correctly B1 Draw the bars correctly B1 Minus 1 for any error
11c	Estimated mean $= \frac{(25 \times 5) + (35 \times 10) + (45 \times 15) + (55 \times 18) + (65 \times 7)}{(5 + 10 + 15 + 18 + 7)}$ $= \frac{2595}{55}$ $= 47.2 \text{ (3 s.f.) or } 47\frac{2}{11}$	M1 A1 or B2
12(a)(i)	$x = k + 1, y = k + 5, z = k + 6$	B1 all three correct
12(a)(ii)	$xy - kz$ $= (k + 1)(k + 5) - k(k + 6)$ $= k^2 + 6k + 5 - k^2 - 6k$ $= 5$	M1Expansion or either bracket correctly A1 answer
12(a)(iii)	The difference between them is 5. $kz = k^2 + 6k; xy = (k^2 + 6k) + 5.$ Since the difference between them is 5, therefore, they must lie in the same column.	B1
12(b)	$k = 5n - 1 \quad \text{or} \quad 4 + 5(n - 1)$	B1
13(a)	Volume of cone = $\frac{1}{3} \times 6^2 \times 8 \times \pi = 96\pi \text{ cm}^3$ Volume of cylinder = $\pi \times 9^2 \times 12 = 972\pi \text{ cm}^3$ Volume of solid = $972\pi - 96\pi$ $= 876\pi \text{ cm}^3$	M1 (vol. of cone) M1(Vol. of cylinder - Vol. of cone) A1

No	Working	Allocation of Marks
13(b)(i)	By Pythagoras Theorem, $\text{Slant height} = \sqrt{6^2 + 8^2}$ $= 10 \text{ cm}$ Surface area of cone to be painted $= \text{curved surface area of cone}$ $= \pi \times 6 \times 10$ $= 60\pi \text{ cm}^2$	B1 AG1
13(b)(ii)	Area of ring to be painted = $\pi \times (9^2 - 6^2) = 45\pi \text{ cm}^2$ Curved surface of cylinder = $2 \times \pi \times 9 \times 12 = 216\pi \text{ cm}^2$ Base of ornament = $\pi \times 9^2 = 81\pi \text{ cm}^2$ Total surface area to be painted = $60\pi + 45\pi + 216\pi + 81\pi$ $= 402\pi \text{ cm}^2 = 1260 \text{ cm}^2 \text{ (3 s.f.) or } 1263.084 \text{ cm}^2$	M1 (Area of ring) M1 / FT1 (if slant height is wrong) A1 (No FT1 if slant height is wrong)
13(c)	Volume of solid = $876\pi \text{ cm}^3$ Volume of sphere = $876\pi \text{ cm}^3$ $\frac{4}{3}\pi r^3 = 876\pi$ $r = \sqrt[3]{\frac{876 \times 3}{4}}$ $r = 8.69337$ $r = 8.69 \text{ cm}$	Make r the subject with cube root, M1 A1
14(a)	$S\$ \frac{2100}{x}$	B1
14(b)	$S\$ \frac{2100}{x+3}$	B1
14(c)(i)	$\frac{2100}{x} - \frac{2100}{x+3} = 9$ $\frac{2100(x+3) - 2100x}{x(x+3)} = \frac{9(x)(x+3)}{x(x+3)}$ $2100x + 6300 - 2100x = 9x^2 + 27x$ $9x^2 + 27x - 6300 = 0$ $9(x^2 + 3x - 700) = 0$ $x^2 + 3x - 700 = 0$	M1 (correct equation, any form) AG1 (correct simplification if wrong, no marks)
14(c)(ii)	$(x-25)(x+28) = 0$ $x = 25 \text{ or } x = -28$	M1 A1
14(d)	Exchange rate in 2012 = $(25 + 3) = 28 \text{ VND}$	B1
15(a)	$p = -5$	B1
15(b)	Curve Points (Refer to graph)	C1 P2 If scale is error / any error minus 1 mark
15(c)	When $y = 3$, $x = 0.45$ or $x = -4.6 (\pm 0.1)$	B1 (for both answer)
15(d)	Equation of line of symmetry: $x = 2.5$	B1