UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	KIRIT NARAIN
CENTRE NUMBER	I N 7 4 4
CANDIDATE NUMBER	0 0 1 4

9357669131

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2012**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
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.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
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.

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 of the marks for this paper is 70.

This document consists of **12** printed pages.

For Examiner's Use

1 The ferry from Helsinki to Travemunde leaves Helsinki at 1730 on a Tuesday.
The journey takes 28 hours 45 minutes.

Work out the day and time that the ferry arrives in Travemunde.

Answer Day Wednesday Time 22:15 [2]

---

2 T R I G O N O M E T R Y

From the above word, write down the letters which have

(a) exactly two lines of symmetry,

Answer(a) I [1]

(b) rotational symmetry of order 2.

Answer(b) N [1]

---

3 For this question, $1 < x < 2$.

Write the following in order of size, **smallest** first.

$\frac{5}{x}$	$5x$	$\frac{x}{5}$	$x - 5$
3.33	7.5	0.3	-3.5

Answer x-5 < x/5 < 5/x < 5x [2]

---

4 $1\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{p}{12}$

Work out the value of p.

Show all your working.

```
3/2 + 1/3 + 1/4 = p/12
18/12 + 4/12 + 3/12 = p/12
25/12 = p/12
12(25/12) = p
25 = p
```

Answer p = 25 [2]

For Examiner's Use

5 A lake has an area of 63 800 000 000 square metres.

Write this area in square kilometres, correct to 2 significant figures.

```
1000 m = 1 km                63,800,000,000/1000000
1000000 m^2 = 1 km^2         63,800 km^2
                             64000 km^
```

Answer 64000 km^2 [2]

---

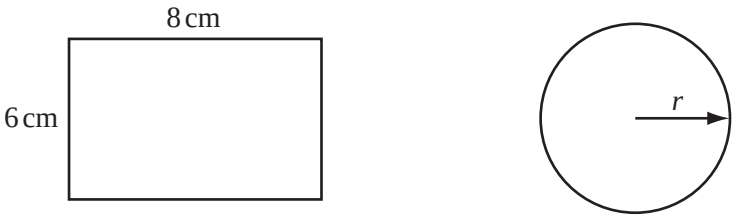
6 x is a positive integer and $15x - 43 < 5x + 2$.

Work out the possible values of x.

```
15x-5x<2+43
10x<45
x<45/10
x<4.5
```

Answer 1, 2, 3, 4 [3]

7



The perimeter of the rectangle is the same length as the circumference of the circle.

Calculate the radius, r, of the circle.

```
12+16 = 28
2*pi*r=28
r = 28/2pi
r= 4.456
r=4.46
```

Answer r = 4.46 cm [3]

For Examiner's Use

8 A car company sells a scale model $\frac{1}{10}$ of the size of one of its cars.

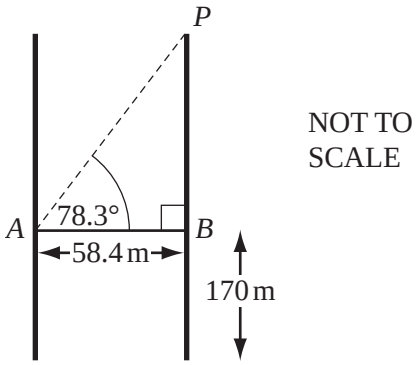
Complete the following table.

	Scale Model	Real Car
Area of windscreen (cm^2)	135	13500
Volume of storage space (cm^3)	408	408 000

[3]

SF = 1/10
AreaFactor = (1/10)^2 = 1/100
VF = (1/10)^3 = 1/1000

9



NOT TO SCALE

The line *AB* represents the glass walkway between the Petronas Towers in Kuala Lumpur.
The walkway is 58.4 metres long and is 170 metres above the ground.
The angle of elevation of the point *P* from *A* is 78.3°.

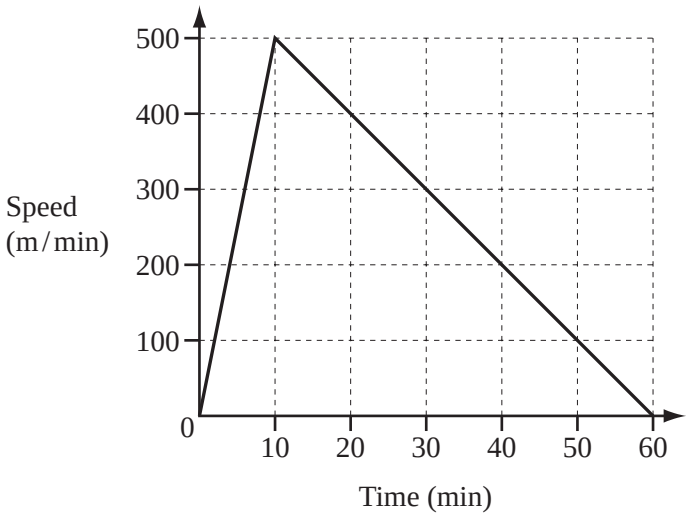
Calculate the height of *P* above the ground.

Tan = Opposite/Adjacent
tan(78.3) = Opp/58.4
tan(78.3)*58.4 = Opp
Opposite = 282.0 m

282+170 = 452 m

Answer 452 m [3]

10



The diagram shows the speed-time graph for a boat journey.

(a) Work out the acceleration of the boat in metres/minute^2.

```
Acceleration = Change in velocity
A = 500/10
A = 50 metres/minute^2
```

Answer(a) ....50..... m/min^2 [1]

(b) Calculate the total distance travelled by the boat.
Give your answer in **kilometres**.

```
500+400+300+200+100+0
250*60
15000 m
15 km
```

Answer(b) .....15..... km [2]

11 y varies directly as the square of $(x - 3)$.
$y = 16$ when $x = 1$.

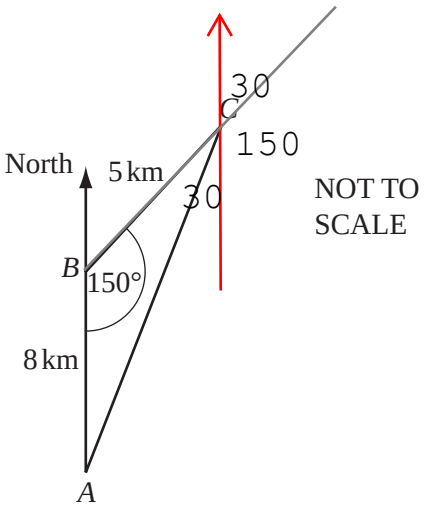
Find y when $x = 10$.

```
y=k*(x-3)^2
16=k*(1-3)^2
16=k*4
16/4 = k
k=4

y=4*(10-3)^2
y=4*49
y=196
```

Answer $y =$ 196 [3]

12



A helicopter flies 8 km due north from A to B. It then flies 5 km from B to C and returns to A.
Angle $ABC = 150°$.

(a) Calculate the area of triangle ABC.

```
Area = 1/2*8*5*sin(150)
Area = 10 km^2
```

Answer(a) 10 km^2 [2]

(b) Find the bearing of B from C.

Answer(b) 210 [2]

For Examiner's Use

13 The taxi fare in a city is \$3 **and** then \$0.40 for every kilometre travelled.

(a) A taxi fare is \$9.

How far has the taxi travelled?

```
3+0.4*x=9
0.4*x=6
x=6/0.4
x=15
```

Answer(a) 15 km [2]

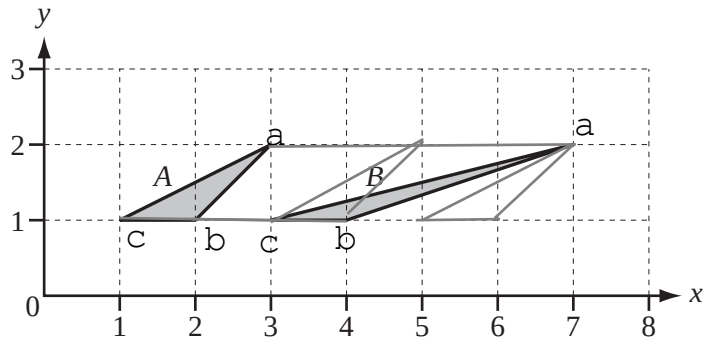
(b) Taxi fares cost 30% more at night.

How much does a \$9 daytime journey cost at night?

```
9*130/100
11.7
```

Answer(b) \$ 11.7 [2]

14



(a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

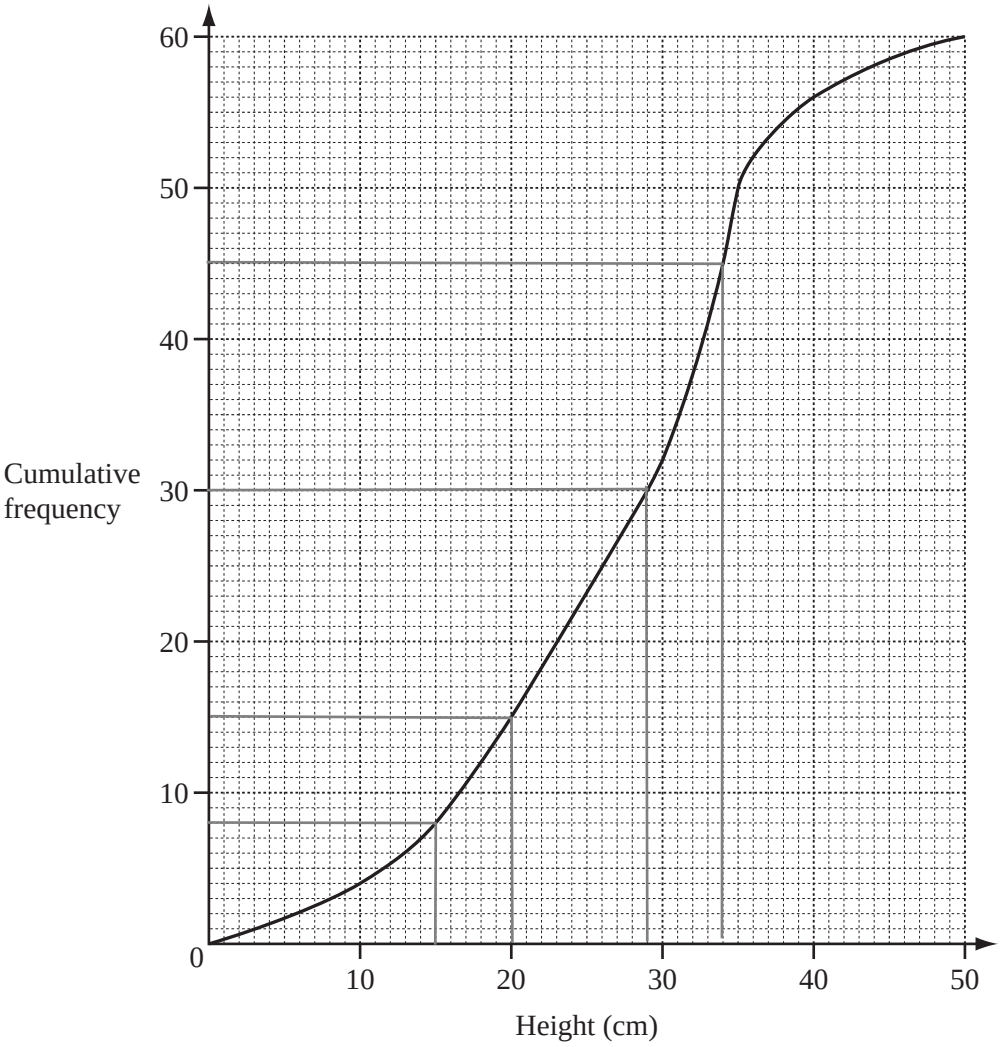
Answer(a) ..... [3]

(b) Find the 2 × 2 matrix which represents this transformation.

$$\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 7 & 0 \\ 0 & 1 \end{pmatrix}$$

Answer(b) ( ) [2]

15



The cumulative frequency diagram shows information about the heights of 60 tomato plants.
Use the diagram to find

(a) the median,

Answer(a) 29 cm [1]

(b) the lower quartile,

Answer(b) 20 cm [1]

(c) the interquartile range,

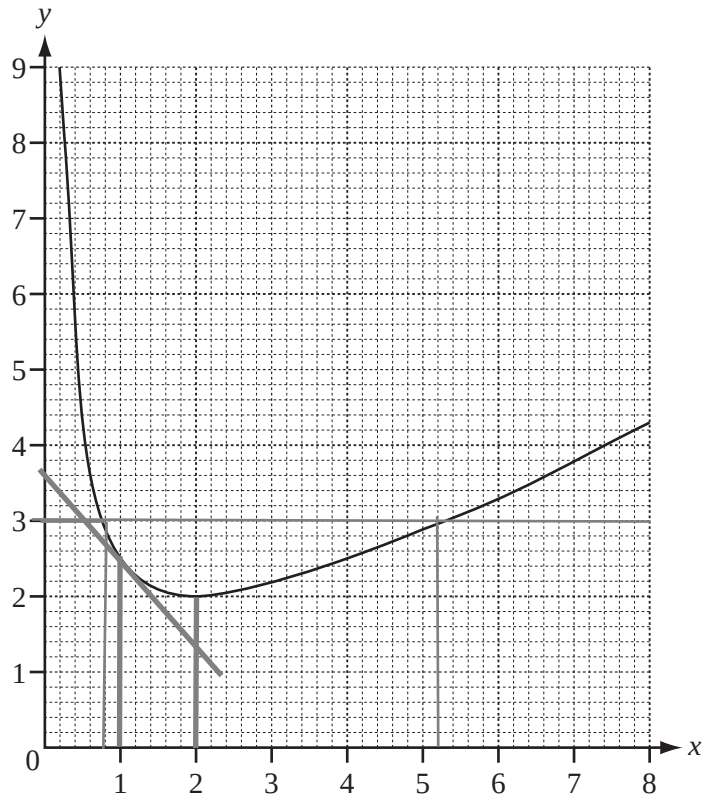
Answer(c) 14 cm [1]

(d) the probability that the height of a tomato plant, chosen at random, will be more than 15 cm.

Answer(d) 86.66% [2]

16

For Examiner's Use



The diagram shows the graph of $y = \frac{x}{2} + \frac{2}{x}$, for $0 < x \leqslant 8$.

(a) Use the graph to solve the equation $\frac{x}{2} + \frac{2}{x} = 3$.

Answer (a) $x =$ 5.2 or $x =$ 0.8 [2]

(b) By drawing a suitable tangent, work out an estimate of the gradient of the graph where $x = 1$.

0, 3.6 1.6, 1.8
-1.8/1.6

Answer(b) -1.13 [3]

For Examiner's Use

17 **(a)** Find the co-ordinates of the midpoint of the line joining $A(-8, 3)$ and $B(-2, -3)$.

```
y = 3/5x+c                                   (-5, 0)
-3 = 3/5*-2+c
-3-3 / -2-8
-6 / -10
6/10
3/5
```

Answer(a) (−5 , 0) [2]

(b) The line $y = 4x + c$ passes through (2, 6).

Find the value of c.

```
6 = 4*2+c
6-8 = c
c = -2
```

Answer(b) $c =$ −2 [1]

(c) The lines $5x = 4y + 10$ and $2y = kx - 4$ are parallel.

Find the value of k.

```
4y = -5x + 10
y = -5/4x + 10
y = k/2x - 2

k/2 = -5/4
k = -5/2
```

Answer(c) $k =$ −5/2 [2]

For Examiner's Use

18 $f(x) = (x + 2)^3 - 5$ $g(x) = 2x + 10$ $h(x) = \frac{1}{x}$, $x \neq 0$

Find

(a) gf (x),

```
gf(x) = 2((x+2)^3 -5)) + 10
        2(x+2)^3
```

Answer(a) gf(x) = 2(x+2)^3 [2]

(b) f $^{1}(x)$,

```
x = (y+2)^3 -5
x+5 = (y+2)^3
cubert(x+5) = y+2
cubery(x+5)-2 = f^-1 (x)
```

Answer(b) f$^{-1}(x)$ = cubery(x+5)-2 [3]

(c) gh$(-\frac{1}{5})$.

```
gh(x) = 2(1/x) + 10
        2/x + 10
gh(-1/5) = 2/-1/5 + 10
         = 0
```

Answer(c) 0 [2]

Question 19 is printed on the next page.

For Examiner's Use

19 Find the values of x for which

(a) $\begin{pmatrix} 1 & 0 & \\ 0 & 2x & 7 \end{pmatrix}$ has no inverse,

Answer(a) $x =$ ..... [2]

(b) $\begin{pmatrix} 1 & 0 & \\ 0 & x^2 & 8 \end{pmatrix}$ is the identity matrix,

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

(c) $\begin{pmatrix} 1 & 0 & \\ 0 & x & 2 \end{pmatrix}$ represents a stretch with factor 3 and the x axis invariant.

Answer (c) $x =$ ..... [2]