HOUGANG SECONDARY SCHOOL
PRELIMINARY EXAMINATION / 2022
SECONDARY FOUR (NORMAL ACADEMIC)

CANDIDATE NAME:							**CLASS:**		
CENTRE NUMBER:	**S**					**INDEX NUMBER:**			

MATHEMATICS 4045/01

Paper 1 **Monday 15 August 2022**

2 hours

Candidates answer on the Question Paper

Instructions to students:

- Write your name, index number and class clearly in the spaces at the top of this page.
- Write in dark blue or black pen on spaces provided.
- You may use an HB pencil for any diagrams or graphs.
- Do not use staples, paper clips, glue or correction fluid.
- Answer **all** the questions in this paper.
- The use of an approved scientific calculator is expected, where appropriate.
- Give non-exact numerical answers correct to 3 significant figures, or one decimal place in case of angles in degrees, unless a different level of accuracy is specified in the question.
- You are reminded of the need for clear presentation in your answers.

Information for pupils

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total mark for this paper is 80.

Calculator Model: _____

80

The Question Paper consists of 21 printed pages (including this cover page)

Mathematical Formulae

Compound Interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

Curved surface area of a cone $= \pi rl$

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

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

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

$$\text{Area of a triangle } ABC = \frac{1}{2}ab\sin C$$

Arc length $= r\theta$, where θ is in radians

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

1 By writing each number correct to 1 significant figure, estimate the value of $\frac{\sqrt{5.07\times 76.1}}{2.32}$.

Answer ..... [2]

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2 Find the smallest integer satisfying $-3x < 20$.

Answer ..... [2]

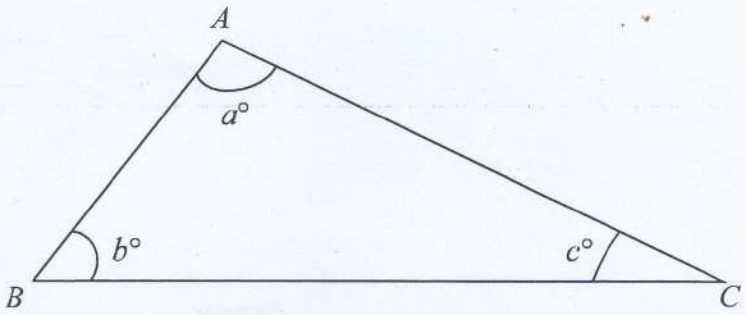
3(a) Show that the point $(-2,6)$ does not lie on the line $3x+4y=12$.

Answer [1]

3(b) Find the coordinates of the y-intercept of the line $3x+4y=12$.

Answer (..... , ...) [1]

4 The diagram shows a triangle ABC where $a:b:c=8:5:2$.



Calculate the value of b.

Answer $b =$ ..... [2]

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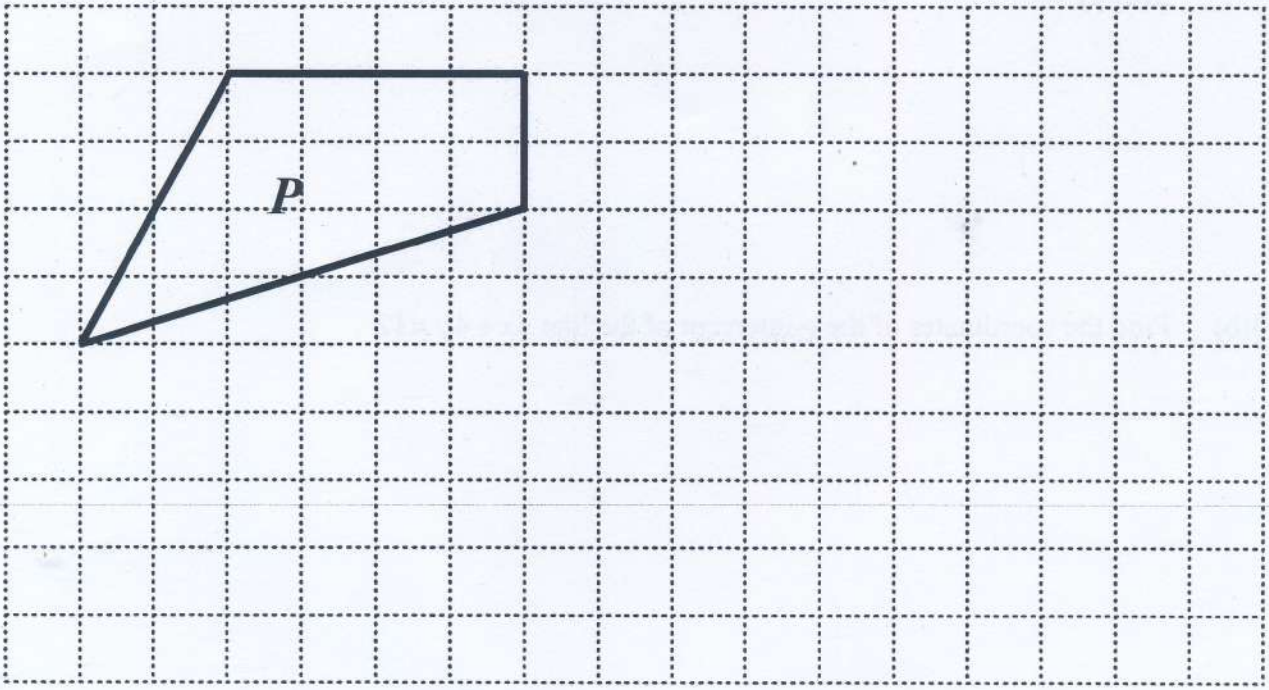
5 On the grid, draw an enlargement of the figure P using a scale factor of $1\frac{1}{2}$. [2]



6 Find the gradient of the line joining the points with coordinates $(8,-3)$ and $(-6,11)$.

Answer ..... [2]

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7 Below is a circular disk divided into 8 equal sectors. A spinner is spun from the centre of the circle and will stop in one of the sectors.

(a) Find the probability that the spinner lands on the number "3".

Answer ..... [1]

(b) Find the probability that the spinner lands on a prime number.

Answer ..... [1]

(c) Find the probability that the spinner lands on the number "6".

Answer ..... [1]

8(a) Write the numbers below in order, starting with the smallest.

$\sin 90°$ $\quad \pi \quad$ 120% $\quad \frac{20}{8}$

Answer ....., ..., ..., ... [2]

8(b) Find the acute angle A such that $\tan A = 0.5$.

Answer angle A = ... [1]

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9 Factorise each of the following completely.

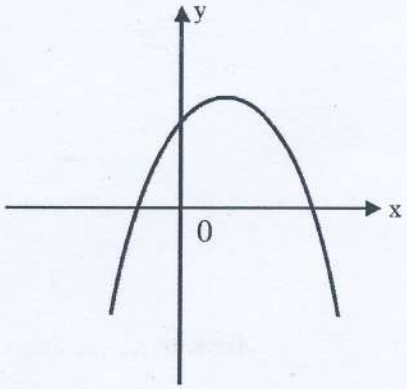
(a) $49y^2 - 1$

Answer ..... [1]

(b) $8ax + 4ay - 2bx - by$

Answer ..... [2]

10(a)

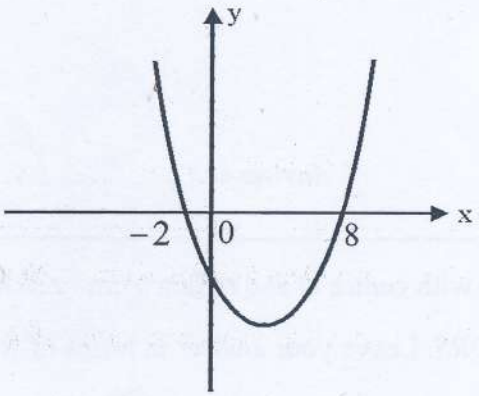


The diagram shows the sketch of $y = ax^2 + 4x + 5$, where a is an integer.

State a possible value for a.

Answer $a =$ ..... [1]

10(b) State the equation of the line of symmetry of this graph of a quadratic function.



Answer ..... [1]

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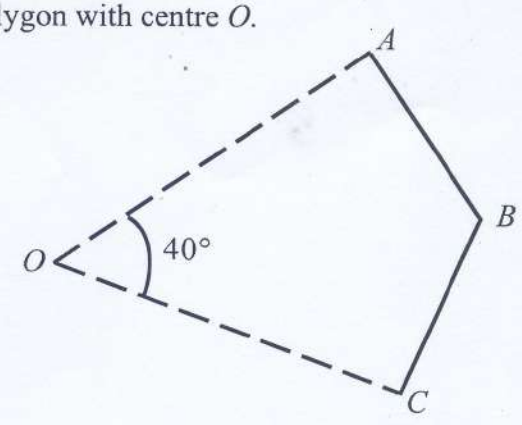
11 The diagram shows part of a regular n-sided polygon with centre O.

AB and BC are two equal sides of the polygon.

Find n.



Answer $n =$ ..... [2]

12(a) Simplify $-7x-11y+10x-2y$.

Answer ..... [1]

12(b) Simplify $\frac{5x}{8y^2} \div \frac{20xy}{6}$.

Give your answer as a single fraction in its simplest form.

Answer ..... [2]

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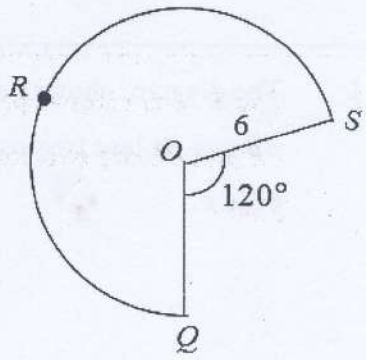
13 The diagram shows a major sector QRS with centre O and radius 6 cm. $\angle SOQ = 120°$.

Find the perimeter of the major sector QRS. Leave your answer in terms of $k\pi + p$.

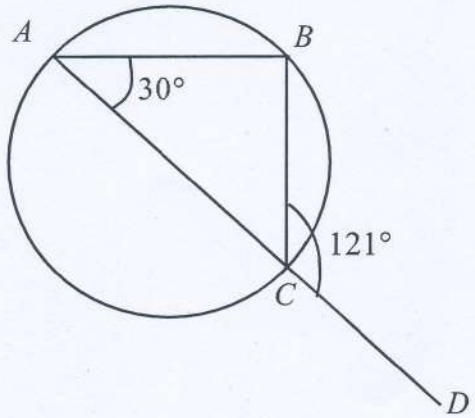


Answer .....cm [2]

14 In the diagram, A, B and C are points on a circle.

ACD is a straight line. $\angle BCD = 121°$ and $\angle BAC = 30°$.

Is AC the diameter of the circle? Explain your answer with relevant workings and reasons.



Answer ..... (Yes / No) because.....

.....

.....

.....[2]

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15 A motorist took 1 hour and 45 minutes to travel from town A to town B which was 120 km apart. He stopped his vehicle at a petrol kiosk for 20 minutes and then travelled another 180 km from town B to town C at a speed of 75 km/h.

Find the average speed of the motorist for the entire journey.

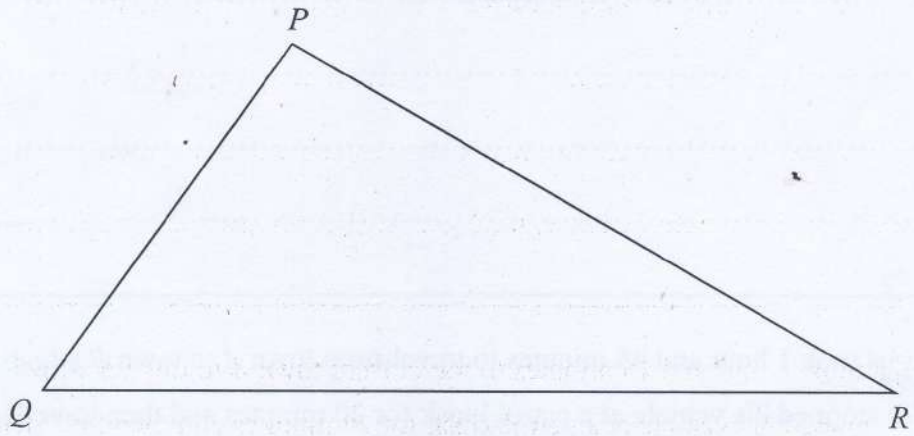
Answer .....km/h [3]

16 P, Q and R are the locations of three schools on the ground.

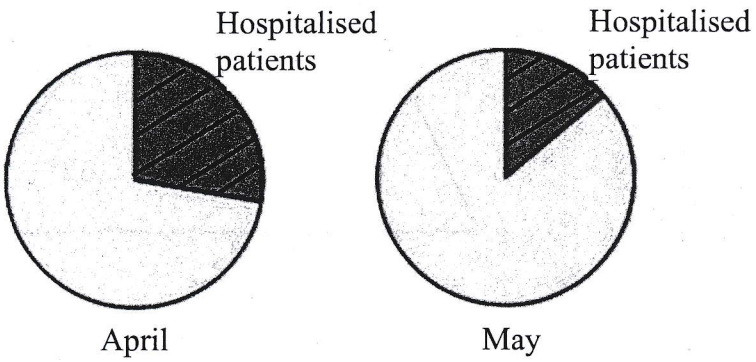
A tuition centre is to be built inside the triangle PQR.

It must be nearer to Q than R, and nearer to QR than QP.

Shade the region in which the tuition centre can be built in. [3]



17 The two pie charts represent the number of patients in the month of April and May respectively. The percentage of hospitalised patients in the months of April and May are represented by the shaded region in the pie charts. The pie charts are **drawn to scale**.



(a) Given that the total number of patients in April is 1350.
Find the number of hospitalised patients in April.

Answer ..... [2]

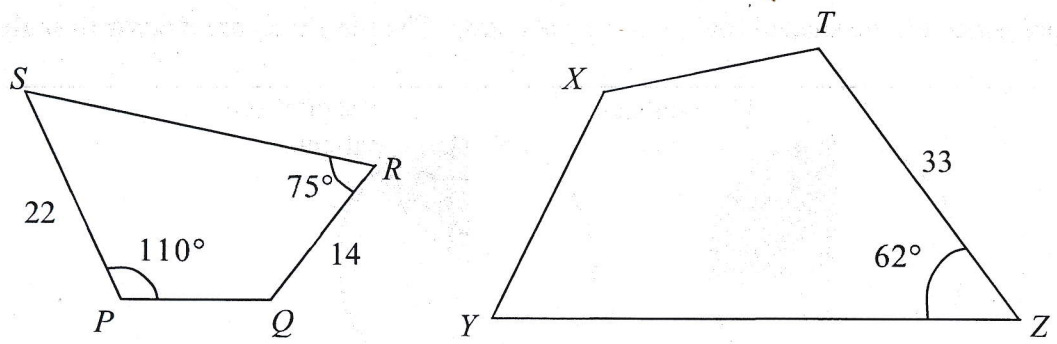
(b) Mr Tay concludes from the pie charts that there are fewer hospitalised patients in the month of May as compared to April. Explain why Mr Tay might be wrong.

Answer : .....

.....

.....[1]

18 In the diagram, $PQRS$ is similar to $TXYZ$. $PS = 22$ cm, $QR = 14$ cm and $ZT = 33$ cm. $\angle QPS = 110°$, $\angle QRS = 75°$, and $\angle YZT = 62°$.



Calculate

(a) $\angle TXY$,

Answer .....° [2]

(b) the length of XY.

Answer .....cm [2]

19 The payment details on the Lift Upgrading Programme for a particular block of flats are partially tabulated below.

Flat Type	Payment ($) by			Flat owner's share of payment (%)
	Government	Town Council	Flat Owner *	
3 – room	10 080	***(p)***	560	***(q)***
4 – room	9520	840	840	7.5
5 – room	***(r)***	1120	1120	***(s)***
*Applicable only to Singapore citizen flat owners				

Find the missing entries if for every

- 3-room flat owner, the town council pays 5% of the total payment.
- 5-room flat owner, the government pays 700% more than the town council.

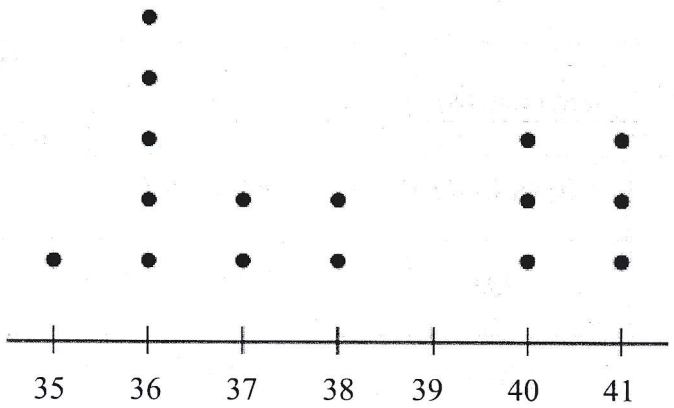
Answer p =$.....[1]

q = ...% [1]

r = $.....[1]

s = ...% [1]

20 The dot diagram below shows the shoes of different sizes sold in a shop on a particular day.



(a) Find the modal shoe size.

Answer .....cm [1]

(b) Find the median shoe size.

Answer .....cm [1]

(c) The shop owner would like to stock up the shoes in the shop.
Which shoe size should he stock up? Explain with reasons.

Answer : He should stock up the shoe size .....because.....

.....

.....[1]

21 The table shows the number of books borrowed by 100 people from a public library.

Number of books	3	4	5	6
Number of people	18	$4x$	26	y

(a) Show that $4x + y = 56$. [1]

Answer

(b) Given that the mean number of books borrowed person is 4.56, show that $8x + 3y = 136$.

Answer [2]

(c) Solve the simultaneous equations to find the value of x and y.

$$4x + y = 56$$
$$8x + 3y = 136$$

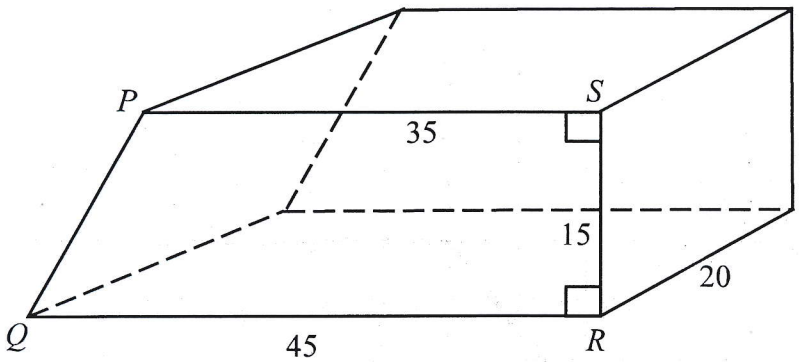
Answer x = ...

y = ... [3]

22 A prism has a cross-section $PQRS$. $PQRS$ is a trapezium with PS parallel to QR.

$PS = 35$ cm, $QR = 45$ cm and $\angle QRS = \angle PSR = 90°$.

The perpendicular height of the prism is 15 cm and its width is 20 cm.



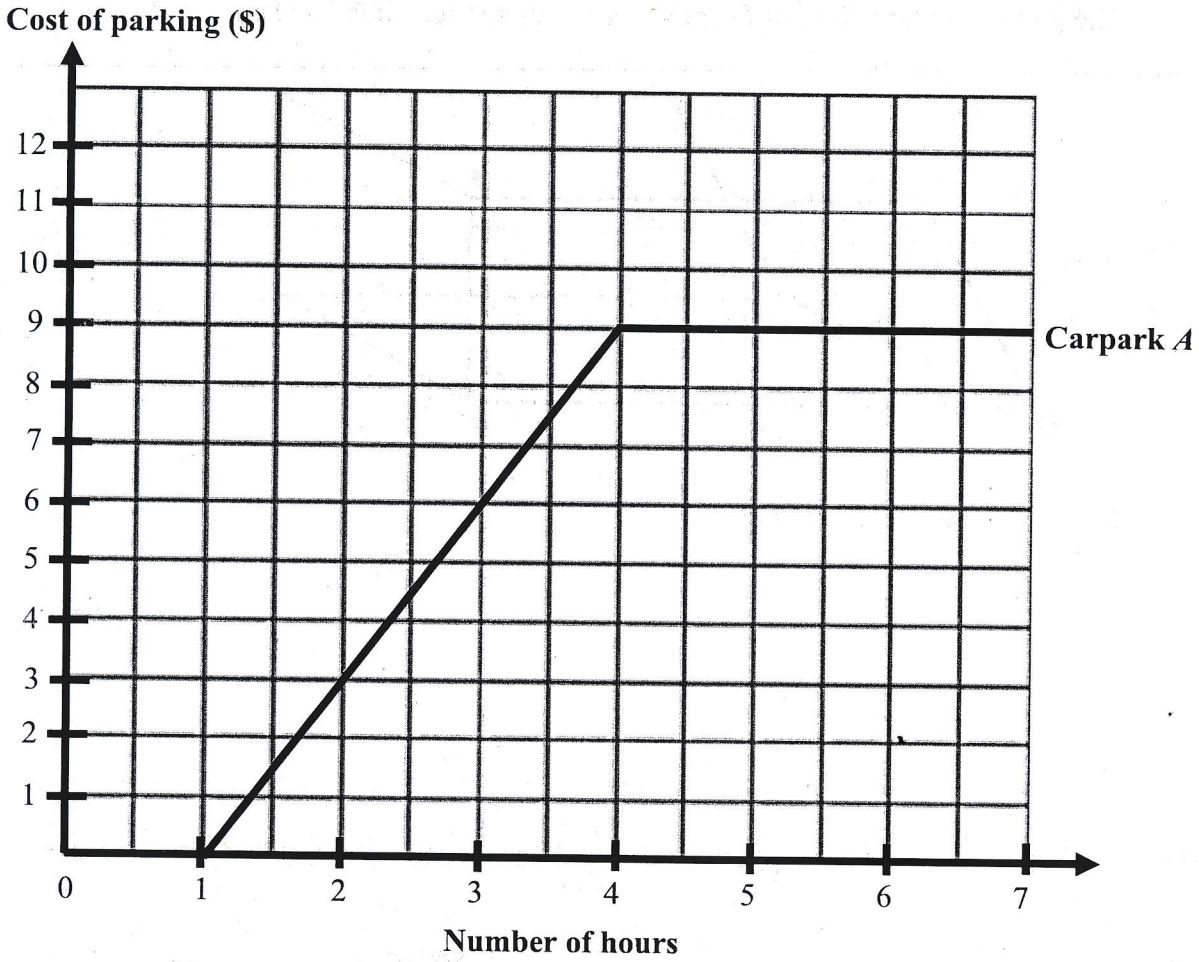
(a) Find the length of PQ.

Answer .....cm [2]

(b) Find the total surface area of the prism.

Answer .....cm^2 [4]

23 The graph shows the cost of parking at Carpark *A*.



(a) How long is the free parking offered in Carpark *A*?

Answer ..... min [1]

(b) What is the rate of parking charges for the next 3 hours?

Answer $...../ h [1]

(c) What does the horizontal line from 4 to 7 hours represent in the graph?

.....

.....

.....[1]

(d) Another carpark, Carpark *B*, offers parking rates at \$4 for the first hour and \$1 for every other hour after the first hour. By drawing a suitable line (s) on the graph above, illustrate the parking charges of Carpark *B* on the graph above. [1]

(e) Carols needs to park her car for 5 hours. Which carpark should she park her car if she wants to save on parking charges? Explain your choice of answer.

Answer Carol should park at Carpark ..... because .....

.....

.....[1]

24 The first four terms in a sequence of numbers are given below.

$$T_1 = 2+1=3$$
$$T_2 = 4+1=5$$
$$T_3 = 6+1=7$$
$$T_4 = 8+1=9$$

(a) Find T_5

Answer ..... [1]

(b) Find an expression for the nth term of the sequence.

Answer ..... [1]

(c) Without calculation, explain why 1000 is not a term in the sequence.

Answer .....

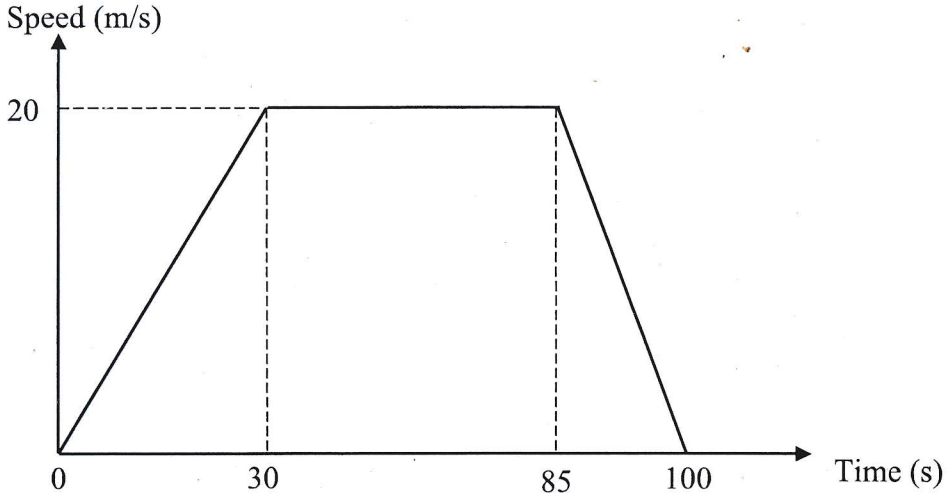
.....

.....[1]

(d) The k^{th} term in this sequence is 155. Find k.

Answer k = ... [2]

25 The diagram shows the speed-time graph for the first 100 seconds of a journey.



(a) Find the deceleration for the last 15 seconds of the journey.

Answer .....m/s^2 [2]

(b) Calculate the speed at the first 18 seconds of the journey.

Answer .....m/s [2]

(c) What is the total distance travelled?

Answer .....m [2]

End of Paper