

1.

Calculate

a) $\sqrt{85.5625}$, [1]

b) $17.576^{\frac{5}{3}}$ [1]

c) By rounding the numbers to 1 significant figure, estimate the value of

$$\frac{1.34+8.99}{9.09-3.917}$$

You must show your working. [1]

a) $\sqrt{85.5625} = 9.25$

b) $17.576^{\frac{5}{3}} = 118.81376 = 119$

c) $\frac{1.34+8.99}{9.09-3.917} = \frac{1+9}{9-4} = \frac{10}{5} = 2$

2.

a) Express 974287 in standard form. [1]

b) Represent

i. $\frac{6}{5}$ on the number line and label it as A.

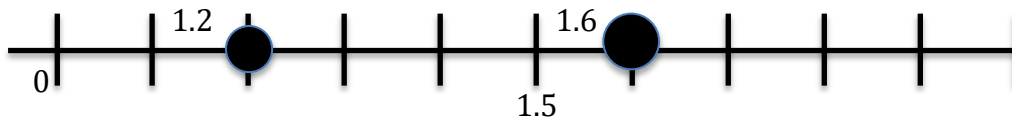
ii. $\sqrt{2.56}$ on the number line and label it as B. [2]

a) $974287 = 9.74 \times 10^5$

b) i) $6/5 = 1.2$

ii) $\sqrt{2.56} = 1.6$

Number line:



3.

A mobile phone shop sells Brand *D* as \$*x* and Brand *F* as \$*y*.

a) A customer buys 7 mobile phone of Brand *D* and 5 mobile phones of Brand *F*. write down the total cost in terms of *x* and *y*. [1]

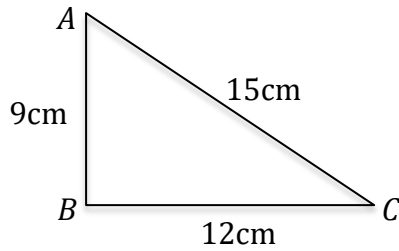
$$$(7x+5y)$$

b) If the customer paid \$4600 for all the items and Brand *F* mobile phones cost \$500 each, how much is one mobile phone of Brand *D*. [2]

$$\begin{aligned} 7x+5y &= 4600 \\ 7x+2500 &= 4600 \\ 7x &= 2100 \\ x &= \$300 \end{aligned}$$

4.

- a) Prove that the triangle below is a right-angled triangle. [2]



$$\begin{aligned} AB^2 + BC^2 &= AC^2 \\ 9^2 + 12^2 &= 15^2 \\ 81 + 144 &= 225 \\ 225 &= 225 \text{ (Triangle ABC is a right} \\ &\text{angled triangle proven by Pythagoras' } \\ &\text{Theorem)} \end{aligned}$$

- b) Hence, find angle BCA . [1]

$$\sin \theta = \frac{9}{15}$$

$$\theta = 36.9^\circ$$

5.

Factorise completely the following

a) $-y^2 - 4y + 21$ or $-(y^2 + 4y - 21)$ [2]
 $= (-y + 3)(y + 7)$ $= -(y - 3)(y + 7)$

b) $15x^2 - 60$ [2]
 $= 15(x^2 - 4)$
 $= 15(x - 2)(x + 2)$

c) $7x - 21y - 14$ [1]
 $= 7(x - 3y - 2)$

6.

a) Write $\frac{4}{x^2-9} + \frac{2}{x+3}$ as a single fraction, simplifying the numerator. [3]

b) Make x to be the subject of the formula, $tx = 2x-3$. [2]

c) Simplify $\frac{5x^2}{20xy}$ [1]

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

b) $tx = 2x - 3$

$$tx - 2x = -3$$

$$x(t - 2) = -3$$

$$x = \frac{-3}{t - 2}$$

$$x = \frac{3}{2 - t}$$

c) $\frac{5x^2}{5(4)xy} = \frac{x}{4y}$

7.

Solve the following

a) $(x - 1) = \frac{12}{x}$ [2]

b) $2y^2 - 4y - 5 = 0$. (correct to 2 decimal places) [2]

c) $\frac{1}{x-1} + \frac{1}{x-3} = 1$ [2]

a) $x(x - 1) = 12$

$$x^2 - x = 12$$

$$x^2 - x - 12 = 0$$

$$(x - 4)(x + 3) = 0$$

$$x = 4 \text{ or } x = -3$$

b) $2y^2 - 4y - 5 = 0$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(-5)}}{2(2)}$$

$$y = 2.87 \text{ or } -0.87$$

c) $\frac{1(x-3)+1(x-1)}{(x-1)(x-3)} = 1$

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

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

$$2x - 4 = x^2 - 4x + 3$$

$$0 = x^2 - 6x + 7$$

$$x^2 - 6x + 7 = 0$$

by quadratic formula, $x = 4.41$ or 1.59

8.

ANSWER THE WHOLE OF THIS QUESTION ON A SINGLE SHEET OF GRAPH PAPER

The equation $y = x^2 - 5x - 1$, is connected by the variables x and y .

The table below shows some of the values of x and the corresponding values of y .

x	-2	-1	0	1	2	3	4	5	6	7
y	13	5	p	-5	-7	-7	q	-1	5	13

a) Find the values of p and q . [2]

b) Using a scale of 2cm to represent 1 unit, draw a horizontal x -axis for $-2 \leq x \leq 7$. Using a scale of 1cm to represent 2 units, draw a vertical y -axis for $-8 \leq y \leq 14$.

On your axes, plot the points given in the table and join them with a smooth curve. [3]

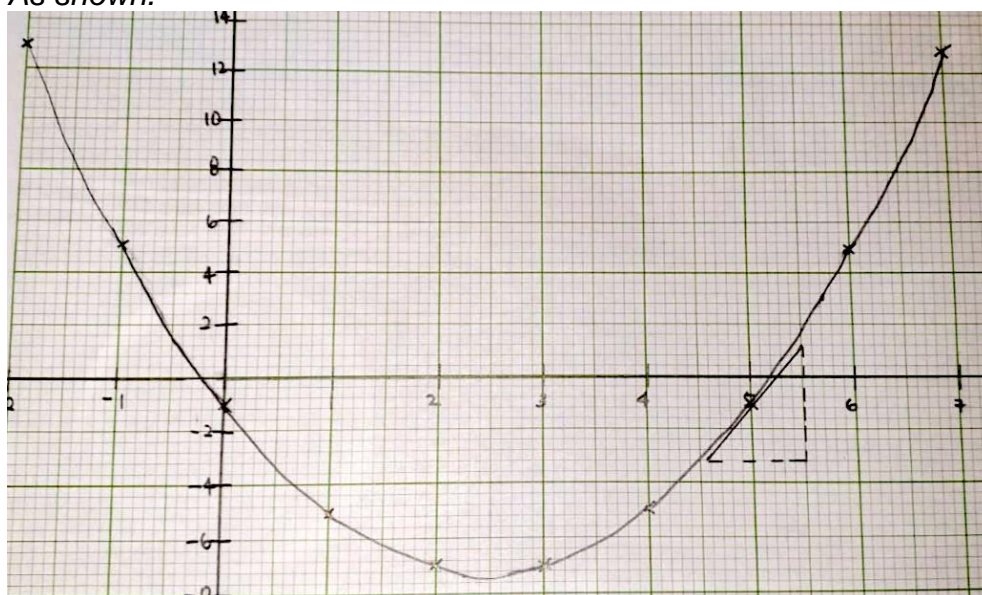
c) By drawing a tangent, find the gradient of the curve at the point where $x = 5$. [2]

d) Write down the minimum point. [1]

e) Write down the line of symmetry. [1]

a) $p = -1$ & $q = -5$

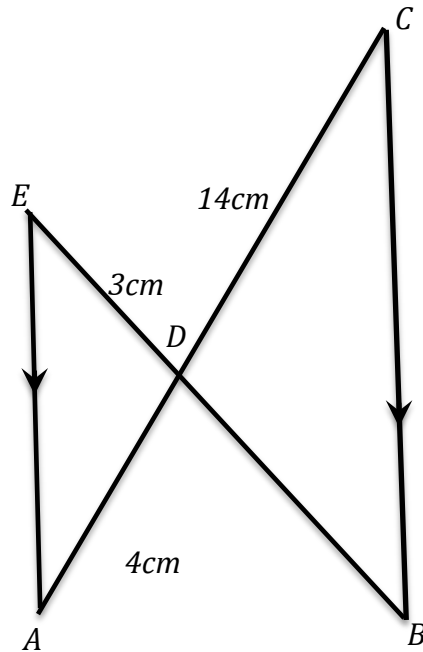
b) As shown.



- c) As shown.
- d) (2.5, 7.25)
- e) $x=2.5$

9.

In the diagram, AE is parallel to BC . ADC and BDE are straight lines.



- a) Name another angle identical to angle EAD . [1]
- b) Name an angle identical to angle DEA . [1]
- c) Hence, prove why triangle EDA is similar to triangle BDC . [1]
- d) Given that $AD = 4\text{cm}$, $DC = 14\text{cm}$ and $ED = 3\text{cm}$, find the length of DB . [1]

- a) Angle DCB or Angle ACB
- b) Angle DBC or Angle EBC
- c) Angle $EAD =$ angle DCB (alternate angles)
 Angle $DEA =$ Angle DBC (alternate angles)
 Angle $EDA =$ angle CDB (vertically opposite angles)
 By rule of similarity, AAA.

d)
$$\frac{AD}{DC} = \frac{ED}{DB}$$

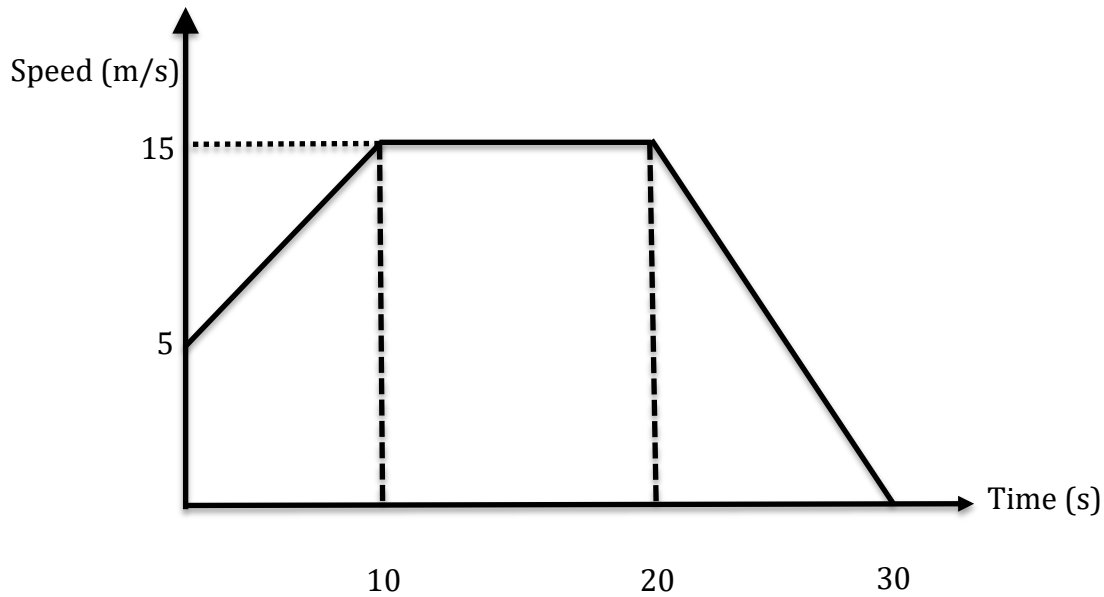
$$\frac{4}{14} = \frac{3}{DB}$$

$$DB = \frac{3 \times 14}{4}$$

$$DB = 10.5\text{cm}$$

10.

a) The speed-time graph shows the first 30 seconds of a car.



- i. The acceleration during the first 10 seconds. [1]
- ii. The total distance travelled. [2]
- iii. Calculate the average speed of the car for the whole journey. [2]

i. Acceleration =

$$\frac{15-5}{10-0} = 1m / s^2$$

ii. Distance travelled =

$$\frac{1}{2}(5+15)(10) + (15)(10) + \frac{1}{2}(10)(15) = 325m$$

iii. Average speed =

$$\frac{325}{30} = 10.8m / s$$

b) Faris is travelling from Singapore to Turkey.

If he changes his money in Singapore, the exchange rate will be
1 Singapore Dollar = 2.43 Turkish Lira.

If he were to change his money in Turkey, the exchange rate is
1 Turkish Lira = 0.21 Singapore Dollar.

- i. If he wants to change SG\$800 in Singapore, how much will he receive in Turkish Lira? [1]
- ii. If he changes SG\$800 in Turkey, how much will he get? [1]
- iii. Which would be more profitable exchange, in Singapore or Turkey? Explain why. [2]

- i. In Singapore, $800 \times 2.43 = 1944$ Turkish Lira
- ii. In Turkey, $800/0.21 = 3809.52$ Lira
- iii. More profitable to exchange in Turkey as he will get more for the same amount of Singapore currency.

Section B (8 marks)

Answer ONLY 1 question

11.

a) The radius of a sector of a circle is 4cm. Its perimeter is 14cm.

i. Find the angle, in radians, of the sector of the circle. [2]

ii. Find the area of the sector. [2]

iii. Convert the angle of the sector into degrees. [1]

ai) Arc length = $14 - 4 - 4 = 6\text{cm}$

$$r\theta = 6\text{cm}$$

$$\theta = 1.5 \text{ rad}$$

aii) $\frac{1}{2}r^2\theta = \frac{1}{2} \times 4^2 \times 1.5 \text{ rad} = 12\text{cm}^2$

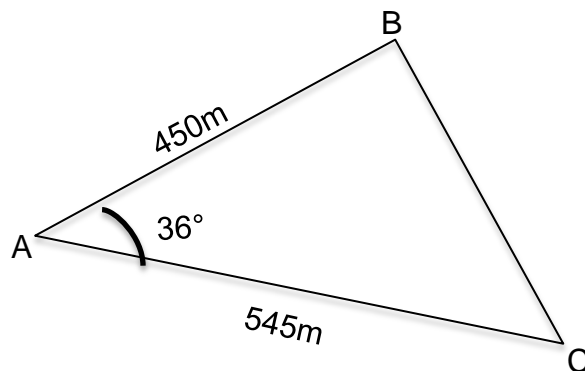
aiii) $\pi \text{ radians} = 180$

$$1.5 \text{ radians} = \frac{180 \times 1.5}{\pi} = 85.0^\circ$$

b) In the diagram below, ABC is a triangle in which angle BAC is 36° . AB is 450m and AC is 545m.

i. Calculate the area of the triangle. [2]

ii. Calculate the length of BC. [2]



i. Area of triangle = $\frac{1}{2} bc \sin A$

$$= \frac{1}{2} (545)(450) \sin 36$$

$$= 72\,077$$

$$= 72\,100 \text{ (3 s.f.)}$$

ii. $a^2 = 450^2 + 545^2 - 2(450)(545) \cos 36^\circ$

$$a = 320\text{m}$$

12. CHALLENGING

- a) An envelope contains 10 red cards, 4 yellow cards and 2 green cards. Johan takes a card at random out of the envelope and places it on the table. He then takes out another card at random from the envelope.

Calculate the possibility that the two cards are

- i. the same colour. [3]
 ii. of different colours. [1]

- i. $P(\text{two cards same colour})$

$$\begin{aligned} &= P(\text{red, red}) + P(\text{yellow, yellow}) + P(\text{green, green}) \\ &= \frac{10}{16} \times \frac{9}{15} + \frac{4}{16} \times \frac{3}{15} + \frac{2}{16} \times \frac{1}{15} \\ &= \frac{13}{30} \end{aligned}$$

- ii. $P(\text{different colours})$

$$\begin{aligned} &= 1 - P(\text{two cards same colour}) \\ &= 1 - \frac{13}{30} \\ &= \frac{17}{30} \end{aligned}$$

- b) The following table shows the number of goals scored by a local team in the Singapore Premier League in the 2018 season.

Goals scored (x)	Frequency
$0 \leq x < 2$	15
$2 \leq x < 4$	6
$4 \leq x < 6$	2
$6 \leq x < 8$	1

- i. Calculate an estimate of the mean of the number of goals scored. [3]
 ii. Give an explanation of why this is only an estimate of the mean of number of goals scored. [1]

i.
$$\begin{aligned} \sum \frac{fx}{f} &= \frac{1 \times 15 + 3 \times 6 + 5 \times 2 + 7 \times 1}{15 + 6 + 2 + 1} \\ &= \frac{50}{24} \\ &= 2.08 \end{aligned}$$

- ii. This is because the midpoint values for each of the goals scored intervals rather than the actual values. For example, $0 \leq x < 2$, we select the value 1 for calculating the mean whereas the actual number of games that the team scored 1 or more goals was not calculated.

Table of Specifications (TOS)

Paper 2 Total marks = 60

<i>Difficulty Level</i>	<i>Simple Question</i>	<i>Sub-Total Marks</i>	<i>Moderate Question</i>	<i>Sub – Total Marks</i>	<i>Challenging Question</i>	<i>Sub-Total Marks</i>
<i>Topic</i>						
	1,2,3,4	12	9	4	10	9
	7	6	5	5	11 or 12	9
			6	6		
			8	9		
<i>Total Marks</i>	<i>Simple</i>	18	<i>Moderate</i>	24	<i>Challenging</i>	18
<i>Weightage</i>		<i>30%</i>		<i>40%</i>		<i>30%</i>