



**KWAZULU-NATAL PROVINCE**

**EDUCATION**  
REPUBLIC OF SOUTH AFRICA



**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**MATHEMATICS  
COMMON TEST  
SEPTEMBER 2022**

*Stanmorephysics.com*

**MARKS:** 75

**TIME:** 1½ hour

**This question paper consists of 8 pages and 1 diagram sheet.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of 6 questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. A DIAGRAM SHEET for QUESTION 3.3.1 and QUESTION 4.1 is attached at the end of this question paper. Detach the DIAGRAM SHEET and hand it in together with your ANSWER BOOK.
10. Write neatly and legibly.

### QUESTION 1

- 1.1 A survey was conducted among 560 drivers about the number of accidents they were involved in during one calendar year. The results are summarised in the table below.



Age of driver	Number of accidents		Total
	Two or fewer	More than two	
30 years and younger	157	51	208
Older than 30 years	304	48	352
Total	461	99	560

- 1.1.1 Use the information in the table to calculate the probability that a driver selected at random from this group:

- (a) is older than 30 years. (2)
- (b) was involved in more than two accidents in the year. (1)
- (c) is older than 30 years and was involved in more than two accidents in the year. (2)

- 1.1.2 Are the events “being involved in more than two accidents in the year” and “being older than 30 years” independent of each other? Motivate your answer by means of relevant calculations. (3)

- 1.2 For two events, A and B, in the sample space S, it is given that:

- $P(A) = 0,55$
- $P(B) = 0,6$
- $P(A \text{ and } B) = 0,25$

- 1.2.1 Draw a Venn diagram to represent this information. (4)

- 1.2.2 Determine  $P[\text{not}(A \text{ or } B)]$ . (1)

- 1.2.3 Determine  $P[A \text{ and } (\text{not } B)]$ . (1)

- 1.3 During a virus pandemic Khanyi decides to visit her friend Nozipho. Neither of them knew that Nozipho had contracted the virus.

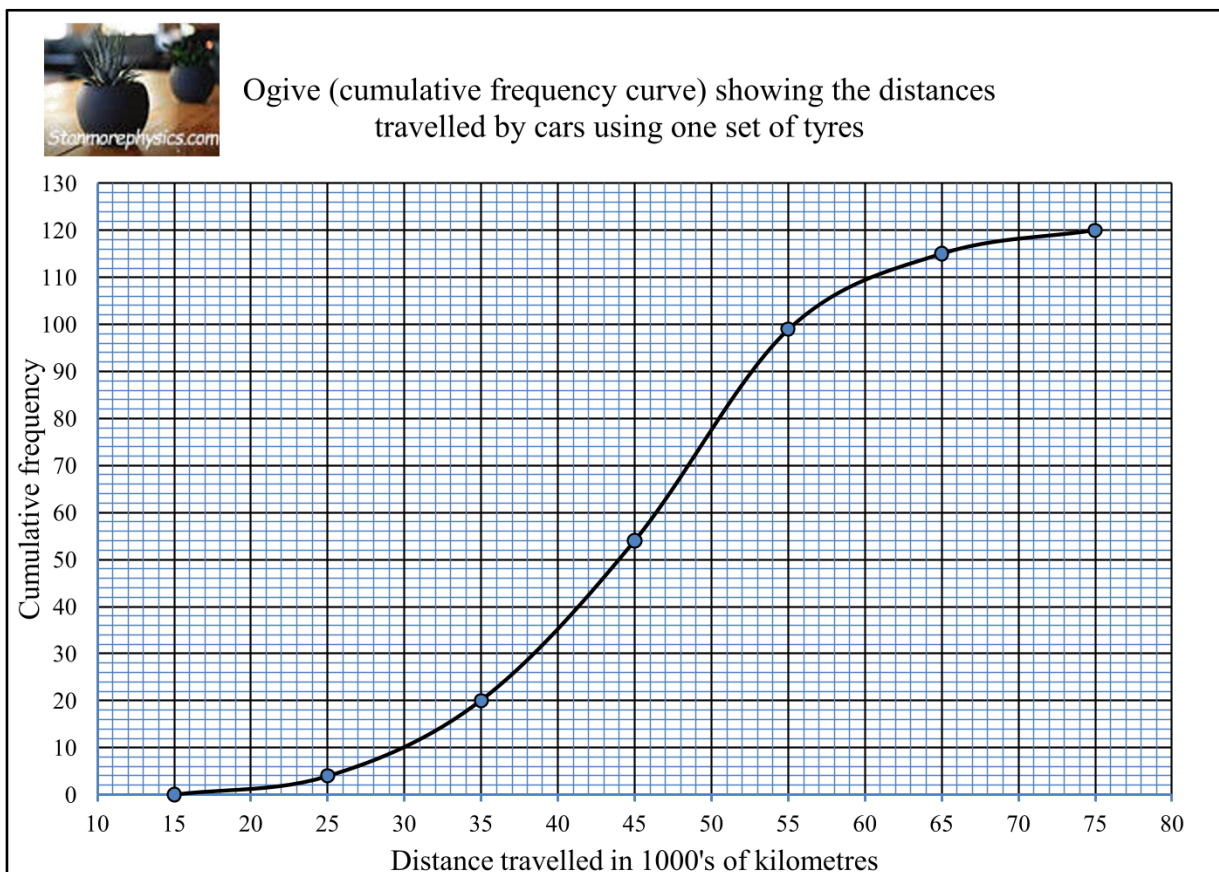
- The probability that both of them will be wearing masks during the visit is 82%.
- If they are wearing masks during the visit, the probability that Khanyi will contract the virus is 8%.
- If they are not wearing masks during the visit, the probability that Khanyi will not contract the virus is 27%.

What is the probability that Khanyi will contract the virus because of the visit to Nozipho?

(5)  
[19]

**QUESTION 2**

A tyre manufacturer collected data on how far cars could travel using one set of tyres. The distances, in 1000's of kilometres, covered by cars using one set of tyres are shown in the ogive (cumulative frequency curve) below.




- 2.1 What is the total number of cars on which data was collected? (1)
  - 2.2 Write down the modal class of the data. (2)
  - 2.3 Use the ogive to determine the median number of kilometres travelled before new tyres were required. (2)
  - 2.4 In the survey, what percentage of the cars travelled more than 50 000 km with one set of tyres? (3)
- [8]**

### QUESTION 3

The data listed below shows the distance (in kilometres) travelled by cyclists on each day of a twelve day cycle tour:

82	89	94	100	113	121
123	128	128	132	135	140

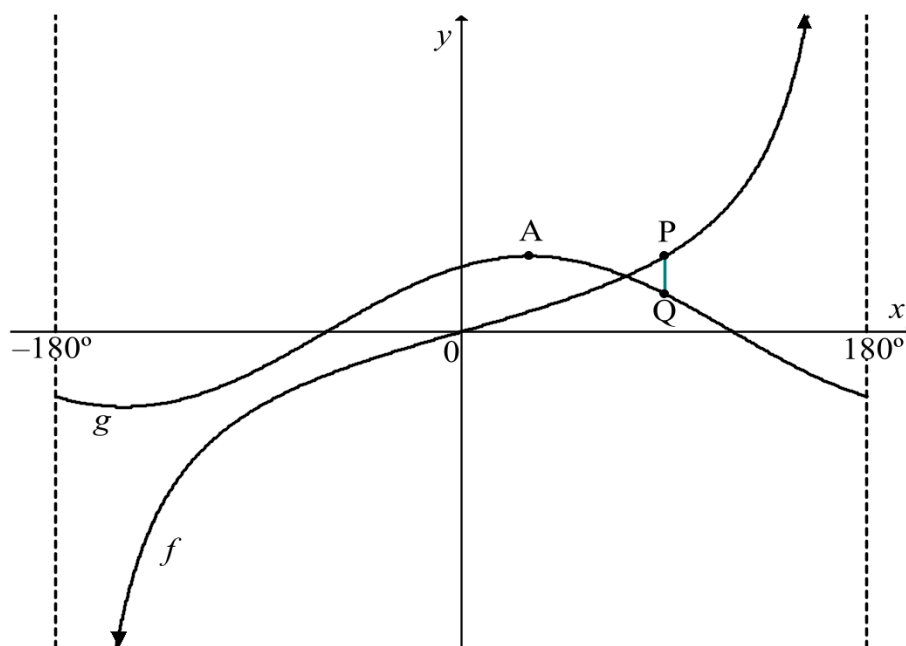
- 3.1 Determine
- 3.1.1 the mean distance travelled per day (2)
- 3.1.2 the standard deviation of the data (1)
- 3.2 On how many days do the cyclists travel a distance that is outside of one standard deviation from the mean? Show all your calculations. (3)
- 3.3 The 5-number summary for the data is as follows:  (82 ; 97 ; 122 ; 130 ; 140).
- 3.3.1 Use the scaled line on the DIAGRAM SHEET to draw a box-and-whisker diagram for this set of data. (3)
- 3.3.2 Comment on the skewness of the data. (1)
- 3.4 Before the start of each day's section of the tour, the cyclists had an additional warm-up ride of  $x$  km. If this is also taken into account, write down, in terms of  $x$  (where applicable)
- 3.4.1 the mean distance travelled per day (2)
- 3.4.2 the standard deviation (1)
- [13]**

**QUESTION 4**

4.1 Draw the graph of  $y = -2\sin x$ , for  $x \in [-90^\circ; 270^\circ]$  on the set of axes provided on the DIAGRAM SHEET. Clearly indicate all intercepts with the axes, turning points and end points. (4)

4.2 In the diagram, the graphs of  $f(x) = \tan bx$  and  $g(x) = \cos(x - 30^\circ)$  are drawn on the same set of axes for  $x \in [-180^\circ; 180^\circ]$ .

$P(90^\circ; 1)$  lies on  $f$  and  $Q$  lies on  $g$ , such that  $PQ$  is parallel to the  $y$ -axis.  
 $A$  is a turning point of  $g$ .



Use the diagram to answer the following questions:

4.2.1 Write down the value of  $b$ . (1)

4.2.2 Write down the coordinates of  $A$ , the turning point of  $g$ . (2)

4.2.3 Write down the coordinates of  $Q$ . (2)

4.2.4 Write down the equation of the asymptote of  $y = \tan b(x + 20^\circ)$  for  $x \in [-180^\circ; 180^\circ]$ . (1)

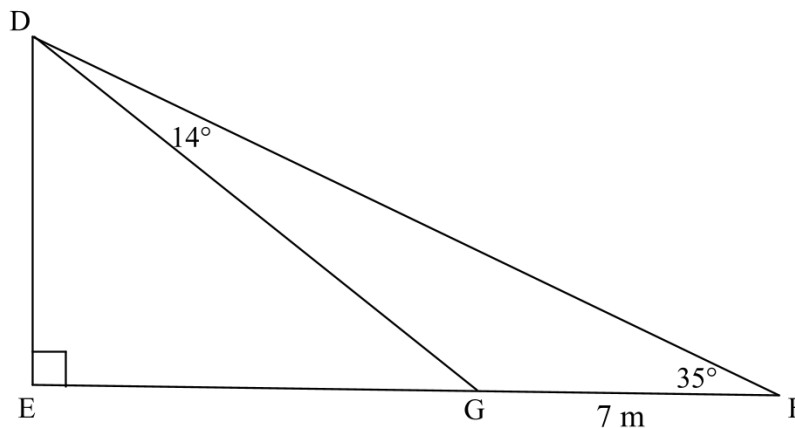
4.2.5 Determine the range of  $h$  if  $h(x) = g(x) + 3$ . (2)

4.2.6 For which values of  $x$ , in the interval  $x \in [0^\circ; 100^\circ]$ , will  $f(x) \cdot g(x) \leq 0$ ? (3)

**[15]**

**QUESTION 5**

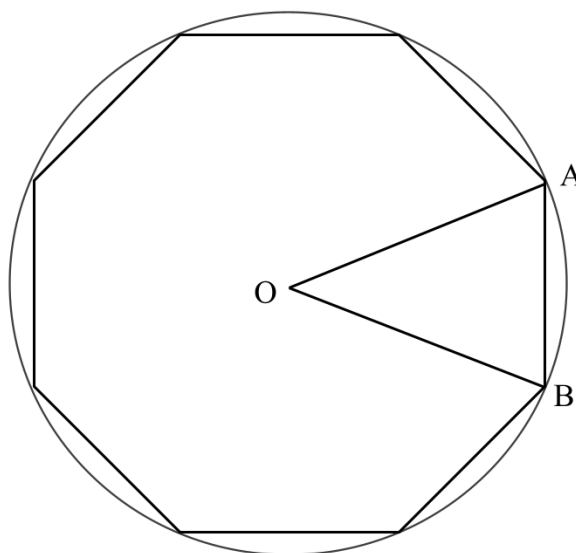
5.1 In the diagram below,  $\hat{F} = 35^\circ$ ,  $\hat{E} = 90^\circ$ ,  $\hat{GDF} = 14^\circ$  and  $FG = 7$  m.



5.1.1 Write down the size of  $\hat{EGD}$ . (1)

5.1.2 Calculate the length of DE. (5)

5.2 The diagram below shows a regular octagon inscribed in a circle of radius  $r$  cm and with centre O. A and B are two vertices of the octagon. AO, BO and AB are drawn.



5.2.1 Show that the area of the octagon is  $2\sqrt{2}r^2$  cm<sup>2</sup>. (4)

5.2.2 If  $r = 5$  cm, calculate the perimeter of the octagon. (3)

**[13]**

**QUESTION 6**

The solid below was made by drilling a right circular cone out of a right rectangular prism (i.e. the cone is removed from the prism).

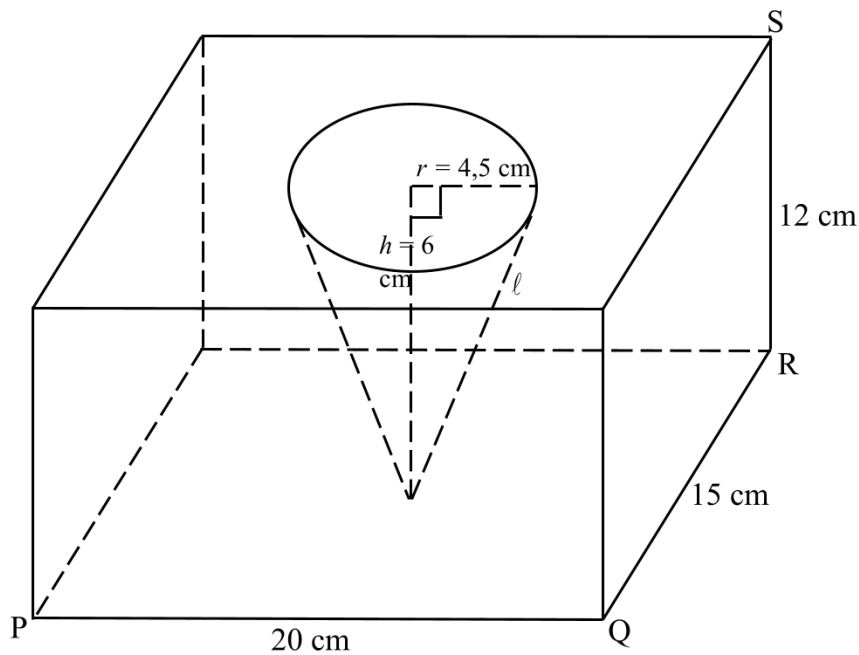
P, Q, R and S are vertices of the prism such that  $PQ = 20$  cm,  $QR = 15$  cm,  $RS = 12$  cm.

The radius of the cone,  $r$ , is 4,5 cm and the height of the cone,  $h$ , is 6 cm.

The slant height of the cone is  $\ell$ .



$\text{Total surface area of a cone} = \pi r^2 + \pi r\ell$
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Calculate the total surface area of the solid.

[7]

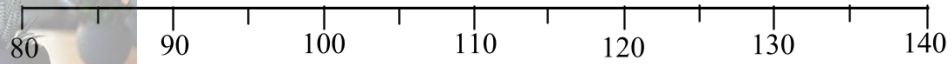
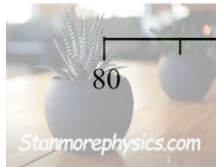
**TOTAL: 75**



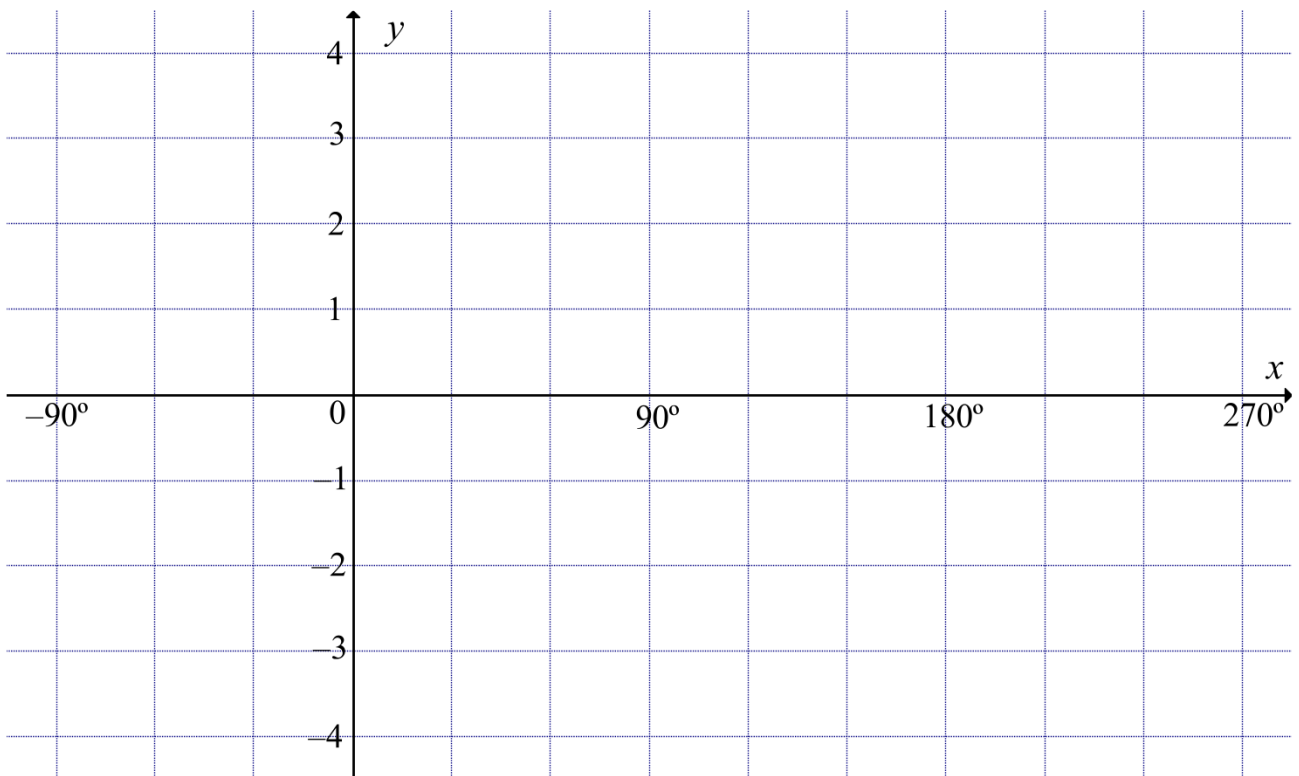
NAME & SURNAME:

**DIAGRAM SHEET**

**QUESTION 3.3.1**



**QUESTION 4.1**





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**GRADE 11**

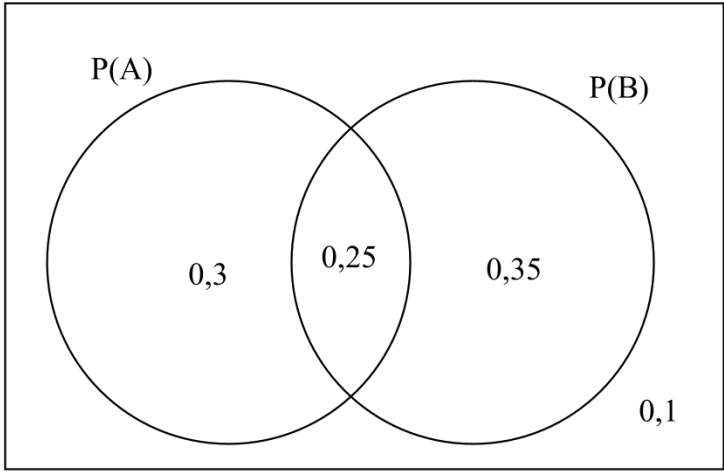
**MATHEMATICS**  
**COMMON TEST**  
**SEPTEMBER 2022**  
**MARKING GUIDELINE**

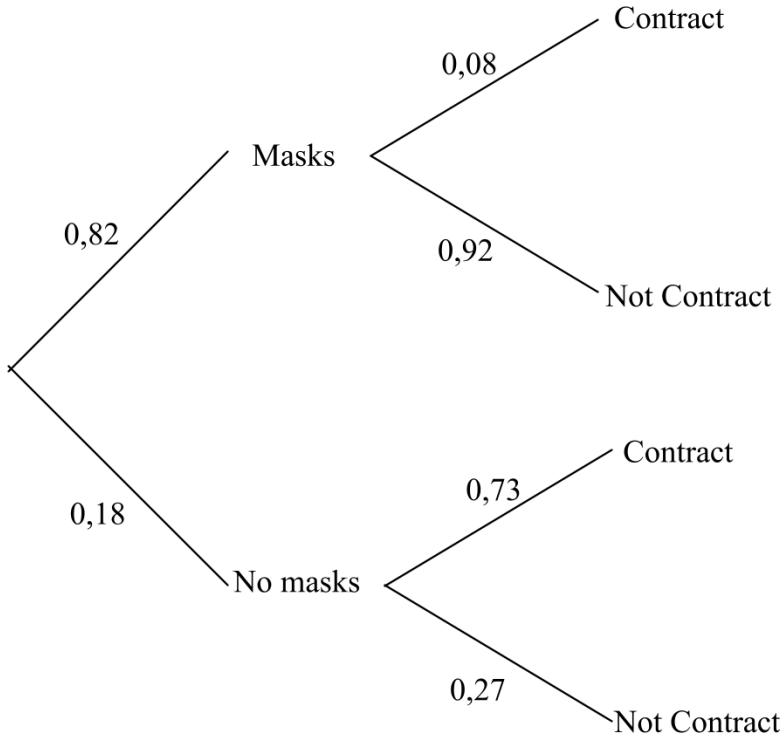
**MARKS: 75**




**This marking guideline consists of 7 pages.**

**QUESTION 1**

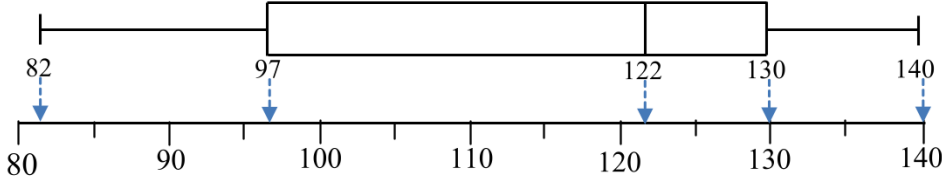
1.1.1 (a)	$P(\text{older than 30 years}) = \frac{352}{560}$ $= 0,63$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 100px;">Answer only: full marks</div>	✓ 352 (as numerator) ✓ 560 (as denominator) (2)
1.1.1 (b)	$P(\text{more than 2 accidents}) = \frac{99}{560}$ $= 0,18$	✓ answer ( $\frac{99}{560}$ or 0,18) (1)
1.1.1 (c)	$P(\text{older than 30 years and more than 2 accidents}) = \frac{48}{560}$ $= 0,09$	✓ 48 in numerator ✓ answer (2)
1.1.2	$P(\text{older than 30 years}) \times P(\text{more than 2 accidents})$ $= \frac{352}{560} \times \frac{99}{560}$ $= \frac{1089}{9800} \text{ or } 0,11$ <p><math>\therefore P(\text{older than 30 years}) \times P(\text{more than 2 accidents}) \neq P(\text{older than 30 years and more than 2 accidents})</math></p> <p>Therefore: the events are not independent</p>	✓ calculating $P(\text{older than 30 years}) \times P(\text{more than 2 accidents})$ ✓ reasoning ✓ conclusion (3)
1.2.1	<div style="text-align: right; margin-bottom: 5px;"><math>P(S)</math></div> 	One mark each for the following values placed correctly: ✓ 0,3 ✓ 0,25 ✓ 0,35 ✓ 0,1 (4)
1.2.2	$P[\text{not}(A \text{ or } B)] = 0,1$	✓ 0,1 (1)
1.2.3	$P[A \text{ and } (\text{not } B)] = 0,3$	✓ 0,3 (1)

<p>1.3</p>	<p>A tree diagram may be drawn to represent all the possible outcomes with their probabilities:</p>  <p> <math>P(\text{mask and contract}) + P(\text{no mask and contract})</math>  <math>= 0,82 \times 0,08 + 0,18 \times 0,73</math>  <math>= 0,20 \text{ or } 20\%</math> </p>	<p>                 ✓✓ <math>0,82 \times 0,08</math>                  ✓✓ <math>0,18 \times 0,73</math>                  ✓ answer after addition                  (accept 19,70%) (5)             </p>
<b>[19]</b>		

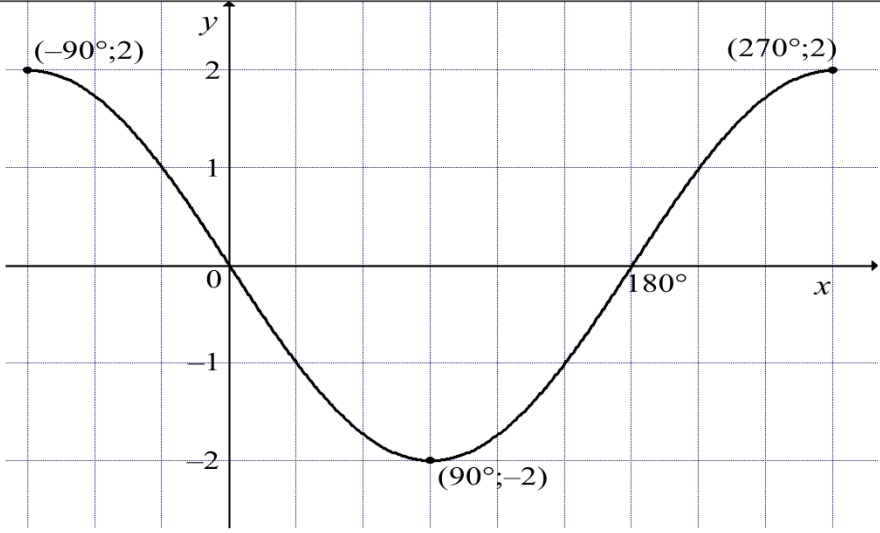
**QUESTION 2**

<p>2.1</p>	<p>120 cars</p>	<p>✓ answer (1)</p>
<p>2.2</p>	<p> <math>45\,000 &lt; x \leq 55\,000</math>  <b>OR</b>  <math>45\,000 \leq x &lt; 55\,000</math> </p>	<p>                 ✓✓ answer (2)                    ✓✓ answer (2)             </p>
<p>2.3</p>	<p>46 500 km</p>	<p>                 ✓✓ answer                  (accept from 46 000 to 47 000)                  (2)             </p>
<p>2.4</p>	<p> <math>120 - 77 = 43 \text{ cars}</math>                  Percentage: <math>\frac{43}{120} = 35,83\%</math> </p>	<p>                 ✓ 77 (accept 76 to 78)                  ✓ 43 (accept 42 to 44)                  ✓ 35,83% (accept 35,0% to 36,67%)                  (3)             </p>
<b>[8]</b>		

**QUESTION 3**

3.1.1	$\frac{1385}{12}$ $= 115,42$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Answer only: full marks</div>	✓ $\frac{1385}{12}$ ✓ answer (2)
3.1.2	18,67 km	✓ answer (1)
3.2	Interval: $(115,42 - 18,67 ; 115,42 + 18,67)$ $= (96,75 ; 134,09)$ Outside of this interval: (82; 89; 94; 135; 140) Therefore: on 5 days	✓ 96,75 ✓ 134,09 ✓ answer (3)
3.3.1		✓ whiskers ending at 82 and 140 ✓ box from 97 to 130 ✓ $Q_2$ at 122 (3)
3.3.2	The data is skewed to the left OR negatively skewed	✓ answer (1)
3.4.1	New mean $= \frac{1385 + 12x}{12}$ $= 115,42 + x$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Answer only: full marks</div>	✓ $\frac{1385 + 12x}{12}$ ✓ $115,42 + x$ (2)
3.4.2	18,67 km	✓✓ answer (1)
		<b>[13]</b>

**QUESTION 4**

4.1		✓ x-intercepts and y-intercept ✓ turning point ✓ end points ✓ shape (4)
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Marking Guideline

4.2.1	$b = \frac{1}{2}$	✓ answer	(1)
4.2.2	$A(30^\circ; 1)$	✓ $30^\circ$ ✓ 1 Stanmorephysics.com	(2)
4.2.3	$Q\left(90^\circ; \frac{1}{2}\right)$	✓ $90^\circ$ ✓ $\frac{1}{2}$	(2)
4.2.4	$x = 160^\circ$	✓ answer	(1)
4.2.5	$2 \leq y \leq 4$  <b>OR</b>  $y \in [2; 4]$	✓ endpoints ✓ correct notation	(2)
4.2.6	$x = 0^\circ$ or $120^\circ \leq x < 180^\circ$  <b>OR</b>  $x = 0^\circ$ or $x \in [120^\circ; 180^\circ)$	✓ $x = 0^\circ$ ✓ endpoints of interval ✓ correct notation	(3)
		✓ $x = 0^\circ$ ✓ endpoints of interval ✓ correct notation	(3)
			<b>[15]</b>

**QUESTION 5**

5.1.1	$49^\circ$	✓ answer	(1)
5.1.2	$\frac{DG}{\sin \hat{F}} = \frac{GF}{\sin \hat{FDG}}$ $\frac{DG}{\sin 35^\circ} = \frac{7}{\sin 14^\circ}$ $DG = \frac{7 \times \sin 35^\circ}{\sin 14^\circ}$ $= \frac{7 \times \sin 35^\circ}{\sin 14^\circ}$ $= 16,60 \text{ m}$ $\frac{DE}{DG} = \sin \hat{EGD}$ $\frac{DE}{16,60} = \sin 49^\circ$ $DE = 16,60 \times \sin 49^\circ$ $= 12,53 \text{ m}$	✓ applying sine rule in triangle DGF ✓ substitution  ✓ length of DG  ✓ substitution in correct trig ratio  ✓ answer	(5)

<p>5.2.1</p>	$\hat{A}OB = \frac{360^\circ}{8} = 45^\circ \quad [\angle \text{ s around a point}]$ $AO = BO = r$ $\text{Area of } \triangle AOB = \frac{1}{2} \cdot AO \cdot BO \cdot \sin \hat{A}OB$ $= \frac{1}{2} \cdot r \cdot r \cdot \sin 45^\circ$ $= \frac{1}{2} r^2 \left( \frac{1}{\sqrt{2}} \right) \quad \text{OR} \quad \frac{1}{2} r^2 \left( \frac{\sqrt{2}}{2} \right)$ $\text{Area of the octagon} = 8 \times \text{Area of } \triangle AOB$ $= 8 \times \left( \frac{1}{2\sqrt{2}} \right) r^2 \quad \text{OR} \quad 8 \times \left( \frac{\sqrt{2}}{4} \right) r^2$ $= \left( \frac{4}{\sqrt{2}} \right) r^2 \quad \text{OR} \quad (2\sqrt{2}) r^2 \text{ cm}^2$ $= \left( \frac{2 \times \sqrt{2} \times \sqrt{2}}{\sqrt{2}} \right) r^2$ $= 2\sqrt{2} r^2 \text{ cm}^2$	<p>✓ <math>\hat{A}OB = 45^\circ</math></p> <p>✓ substitution into area rule</p> <p>✓ <math>\frac{1}{2} r^2 \left( \frac{1}{\sqrt{2}} \right)</math> OR <math>\frac{1}{2} r^2 \left( \frac{\sqrt{2}}{2} \right)</math></p> <p>✓ <math>8 \times \text{Area of } \triangle AOB</math></p> <p style="text-align: right;">(4)</p>
<p>5.2.2</p>	$AB^2 = AO^2 + BO^2 - 2 \cdot AO \cdot BO \cdot \cos \hat{A}OB$ $= 5^2 + 5^2 - 2(5)(5) \cos 45^\circ$ $= 14,64$ <p>∴ AB = 3,83 cm</p> <p>∴ perimeter = 8 × 3,83 = 30,61 cm</p>	<p>✓ substitution into cosine rule</p> <p>✓ length of AB</p> <p>✓ answer</p> <p style="text-align: right;">(3)</p>
<b>[13]</b>		

## QUESTION 6

$\begin{aligned} \text{TSA of prism} &= 2(12 \times 20) + 2(12 \times 15) + 2(15 \times 20) \\ &= 480 + 360 + 600 \\ &= 1440 \text{ cm}^2 \\ \text{Area of circular base of cone} &= \pi \times r^2 \\ &= \pi \times 4,5^2 \\ &= 63,62 \text{ cm}^2 \\ \text{Slant height of cone } (\ell) &= \sqrt{h^2 + r^2} \\ &= \sqrt{6^2 + 4,5^2} \\ &= 7,5 \text{ cm} \\ \text{Lateral surface area of cone} &= \pi \times r \times \ell \\ &= \pi \times 4,5 \times 7,5 \\ &= 106,03 \text{ cm}^2 \\ \text{TSA of solid} &= 1440 + 106,03 - 63,62 \\ &= 1482,41 \text{ cm}^2 \end{aligned}$	$\begin{aligned} &\checkmark 2(12 \times 20) + 2(12 \times 15) + 2(15 \times 20) \\ &\checkmark \text{ answer} \\ &\checkmark 63,62 \text{ cm}^2 \\ &\checkmark \text{ using Theorem of Pythagoras} \\ &\checkmark 7,5 \text{ cm} \\ &\checkmark 106,03 \text{ cm}^2 \\ &\checkmark \text{ answer} \end{aligned}$
	<b>[7]</b>

**TOTAL: 75**