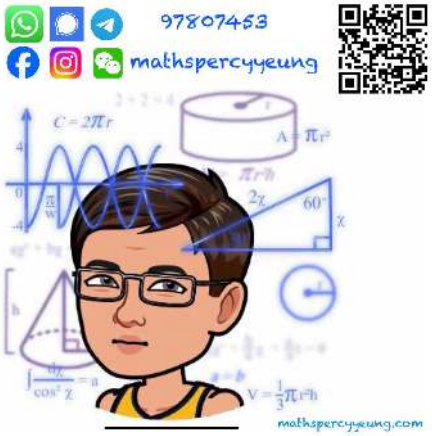
2022-2023 S2
1st TERM EXAM
MATH

2022 – 2023
S2 First Term Examination

MATHEMATICS

Question–Answer Book

4th January, 2023
8:15 am – 9:45 am (1 hour 30 minutes)
This paper must be answered in English



INSTRUCTIONS

1. Write your name, class and class number in the spaces provided on this cover.

2. Answer ALL questions in Section A. You should use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured. You should mark only ONE answer for each question. If you mark more than one answer, you will receive NO MARKS for that question.

3. Attempt ALL questions in Sections B and C. Write your answers in the spaces provided in this Question – Answer Book.

4. Unless otherwise specified, all working must be clearly shown and numerical answers should be either exact or correct to 3 significant figures.

5. The diagrams in this paper are not necessarily drawn to scale.

Sections	Marks
A Total	**/30**
B (31 – 33)	
B (34 –39)	
B Total	**/40**
C Total	**/30**
TOTAL	**/100**

Section A (30 marks)

Choose the best answer for each question.

1. x and y are in inverse proportion. When $x = 4$, $y = 6$. When $x = 8$, what is the value of y?

   A. 2
   B. 3
   C. $\frac{16}{3}$
   D. 12

2. Mr. Wong can make 1.5 tables per hour. How many hours does he need to make 6 tables ?

   A. 2
   B. 4
   C. 6
   D. 7.5

3. 3 hours : 30 seconds =

   A. 6 : 1.
   B. 1 : 10.
   C. 100 : 1.
   D. 360 : 1.

4 If $x : y = 1 : 2$ and $z : y = 4 : 3$, find $x : y : z$.

   A. 1 : 2 : 4
   B. 2 : 4 : 3
   C. 3 : 6 : 8
   D. 4 : 3 : 6

5. Refer to the table below.

x	6	15	22
y	48	120	176

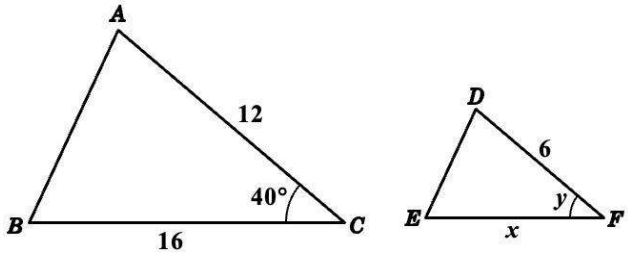
   It is given that x is directly proportional to y. What is the relationship between x and y?

   A. $y = 8x$
   B. $y = 288x$
   C. $xy = 8$
   D. $xy = 288$

6. There are 12 floors in a shopping centre from 1/F to 12/F, with 2 male washrooms and 2 female washrooms on each floor. An extra female washroom is going to be added to every even-numbered floor. What will be the ratio of the number of male washrooms to that of female washrooms in the shopping centre?

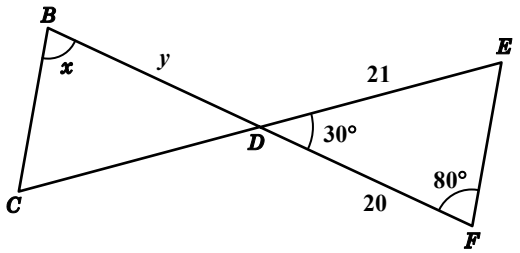
   A. 1 : 1
   B. 1 : 2
   C. 2 : 3
   D. 4 : 5

7. In the figure, $\triangle ABC \sim \triangle DEF$. Find x and y.



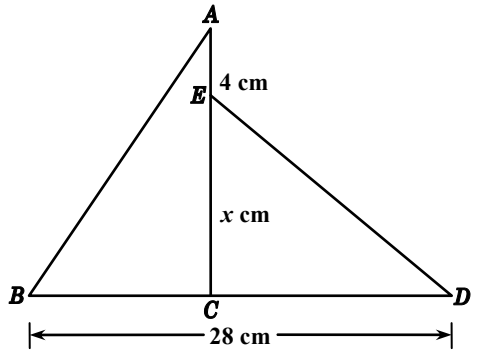
   A. $x = 8, y = 20°$
   B. $x = 8, y = 40°$
   C. $x = 12, y = 20°$
   D. $x = 12, y = 40°$

8. In the figure, BF and CE intersect at D. If $\triangle BCD \cong \triangle EFD$, find x and y.



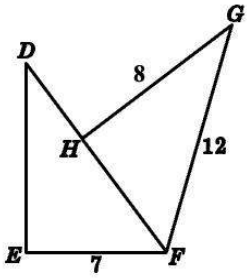
   A. $x = 70°, y = 20$
   B. $x = 70°, y = 21$
   C. $x = 80°, y = 20$
   D. $x = 80°, y = 21$

9. In the figure, AEC and BCD are straight lines. If $\triangle ABC \cong \triangle DEC$, find CD.



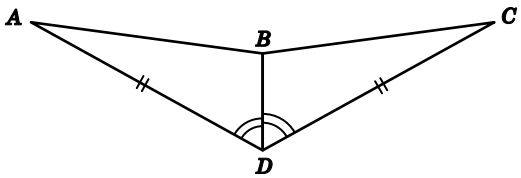
A. 16 cm
B. 18 cm
C. 22 cm
D. 24 cm

10. In the figure, DHF is a straight line and $\triangle DEF \cong \triangle GHF$. Find DH.



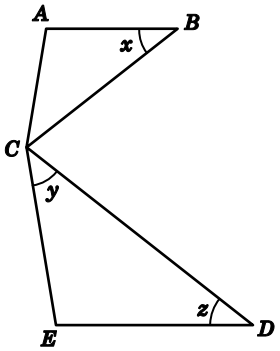
A. 1
B. 4
C. 5
D. 7

11. Refer to the figure. Which of the following must be correct?



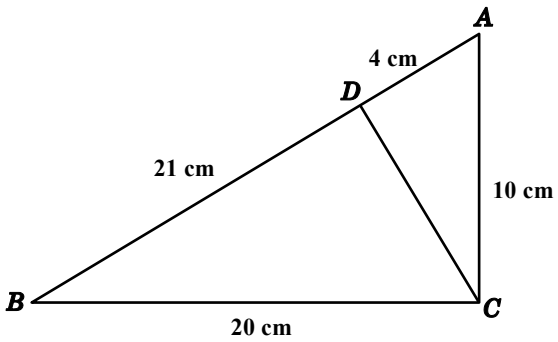
A. $\triangle ABD \cong \triangle DBC$
B. $\triangle DAB \cong \triangle DBC$
C. $\triangle ABD \cong \triangle CBD$
D. $\triangle BAD \cong \triangle CBD$

12. In the figure, $\triangle ABC \sim \triangle EDC$. Which of the following must be correct?



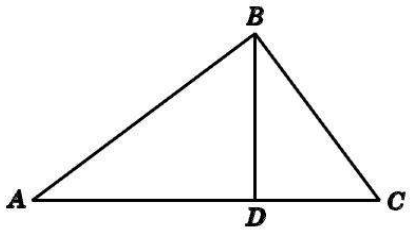
A. $x = z$
B. $x = y$
C. $AB = ED$
D. $AB = CE$

13. In the figure, ADB is a straight line. Which of the following must be true?



A. $\triangle ABC \sim \triangle ACD$ (*ratio of 2 sides, inc. ∠*)
B. $\triangle ABC \sim \triangle CBD$ (*ratio of 2 sides, inc. ∠*)
C. $\triangle ABC \sim \triangle CBD$ (*3 sides proportional*)
D. $\triangle ABC \sim \triangle ACD$ *(3 sides proportional)*

14. In the figure, ADC is a straight line. $BD \perp AC$ and $AB \perp BC$. Which of the following must be correct?



I. $\angle ABD = \angle ACB$

II. $\Delta ABC \sim \Delta ADB$

III. $AB^2 = AC \times AD$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

15. The following cumulative frequency table shows the weights of some boys.

Weight less than (kg)	Cumulative frequency
20.5	0
30.5	1
40.5	9
50.5	10

Which of the following must be true?

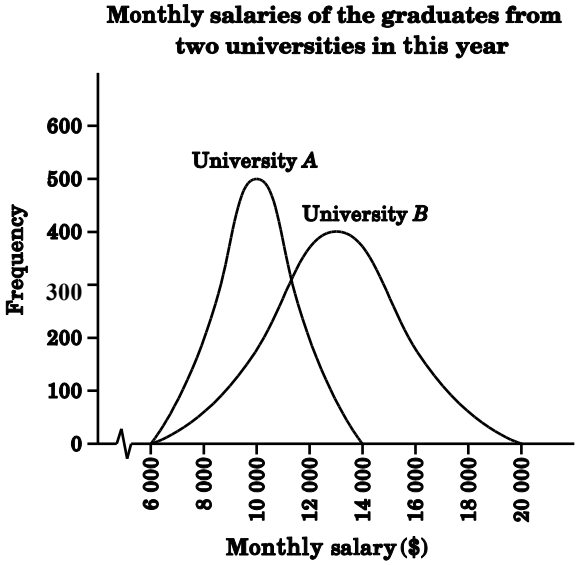
A. The total number of boys is 20.

B. 9 boys are lighter than 40.5 kg.

C. The weight of the lightest boy is 20.5 kg.

D. The weight of the heaviest boy is 50.5 kg.

16. The frequency curves below show the distribution of the monthly salaries of the graduates from two universities in this year.



Which of the following must be true?

I. University A has more graduates.

II. The number of graduates from University B is 400.

III. The graduates from University B have higher monthly salaries on the whole.

A. II only

B. III only

C. I and II only

D. I and III only

17. Which of the following statistical diagrams is most suitable to show the trend of the profits of a company in the past 10 years?

A. Broken line graph

B. Pie chart

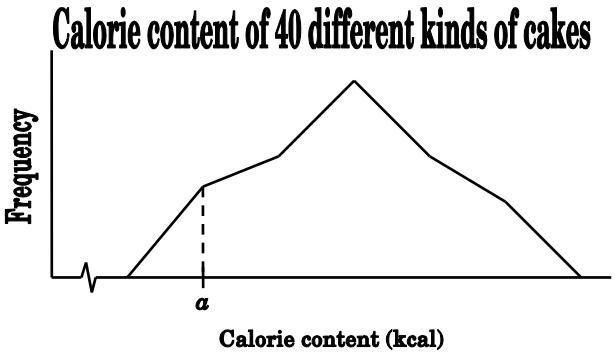
C. Frequency polygon

D. Stem-and-leaf diagram

18. The table below shows the calorie contents of 40 different kinds of cakes.

Calorie content (kcal)	*51–100*	*101–150*	*151–200*	*201–250*	*251–300*
Frequency	6	8	13	8	5

The following frequency polygon presents the data in the above table.



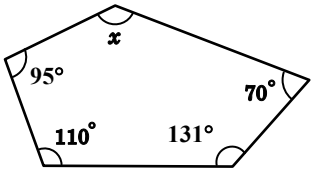
What is the value of a?

A. 6
B. 50.5
C. 75.5
D. 125.5

19. Find the size of each interior angle of a regular 16-sided polygon.

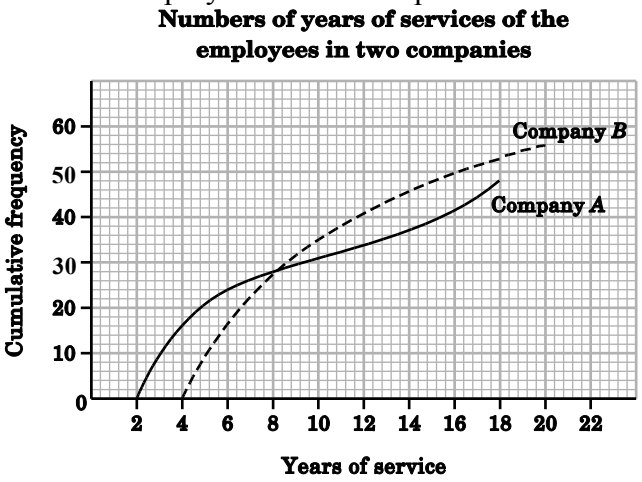
A. 337.5°
B. 202.5°
C. 157.5°
D. 22.5°

20. Find x in the figure.



A. 128°
B. 130°
C. 132°
D. 134°

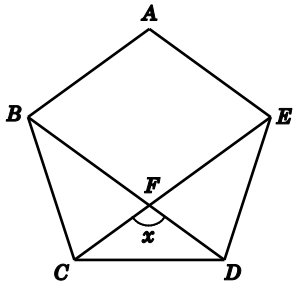
21. The cumulative frequency curves below show the numbers of years of services of the employees in two companies.



Which of the following is true?

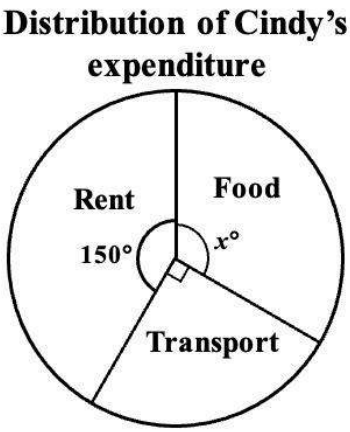
A. Company A has 2 more employees than company B.
B. Company B has 2 more employees than company A.
C. Company A has 8 more employees than company B.
D. Company B has 8 more employees than company A.

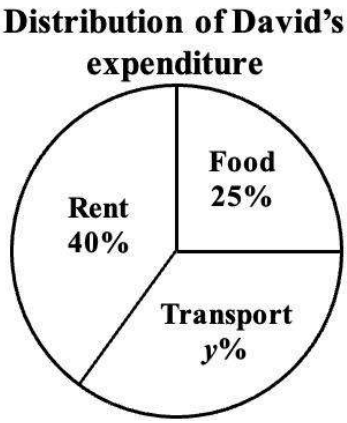
22. In the figure, $ABCDE$ is a regular pentagon. BD and CE intersect at F. Find x.



A. 108°
B. 136°
C. 144°
D. 172°

23. The pie charts below show the distributions of Cindy's expenditure and David's expenditure in a certain month.

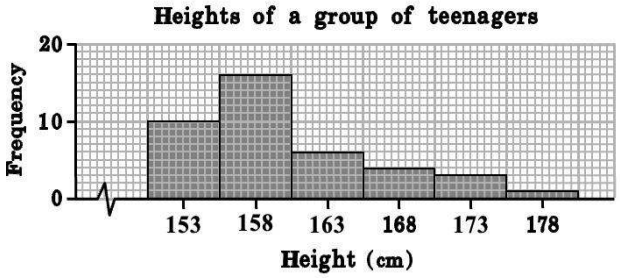




Which of the following must be true?

A. $x = 160$
B. $y = 45$
C. In that month, Cindy's expenditure on transport is the same as David's expenditure on food.
D. In that month, David's expenditure on rent is greater than his expenditure on transport.

24. The histogram below shows the heights of a group of teenagers.

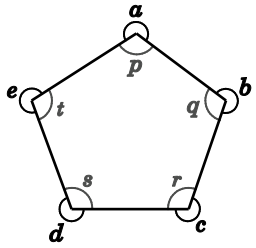


Which of the following must be correct?

I. The class width of each class interval is 5 cm.
II. The 3 tallest teenagers are at least 170.5 cm tall.
III. 6 teenagers in the group are 163 cm tall.

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

25. In the figure, $a + b + c + d + e =$

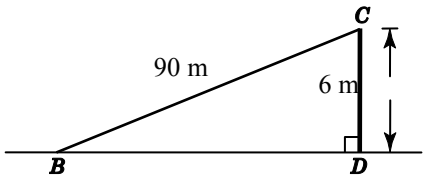


A. 360°.
B. 540°.
C. 1 260°.
D. 1 440°.

26. If each interior angle of a regular polygon is greater than its exterior angle by 135°, find the number of sides of the regular polygon.

A. 8
B. 10
C. 12
D. 16

27. In the figure, CD is a vertical pole. BC is a straight wire joining the top C of the pole and point B on the ground. Find the distance between B and D, correct to the nearest 0.1 m.

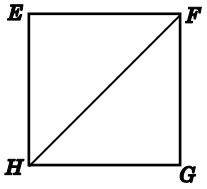


A. 86.5 m
B. 89.7 m
C. 89.8 m
D. 90.2 m

28. In $\triangle PQR$, PQ = 4 cm, QR = 3 cm and $\angle R = 90^\circ$. Find PR.

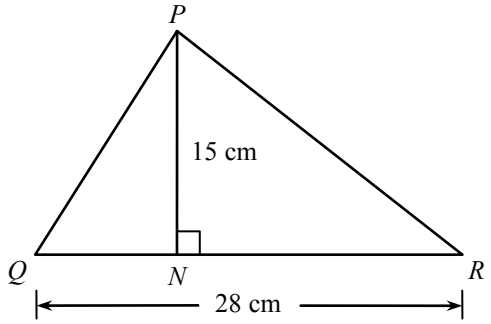
A. 1 cm
B. $\sqrt{7}$ cm
C. 5 cm
D. 7 cm

29. In the figure, $EFGH$ is a square of area 8 cm^2. Find FH.



A. $\sqrt{2}$ cm
B. 2 cm
C. $\sqrt{8}$ cm
D. 4 cm

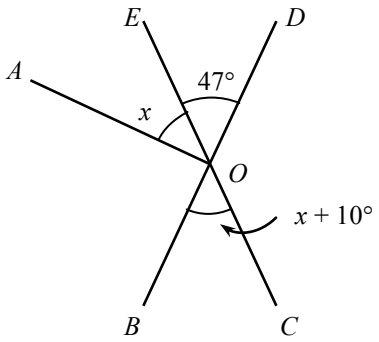
30. In the figure, N is a point lying on QR. If the area of $\triangle PQN$ is less than the area of $\triangle PRN$ by 90 cm^2, then PQ =



A. 17 cm.
B. 19 cm.
C. 20 cm.
D. 25 cm.

Section B (40 marks)

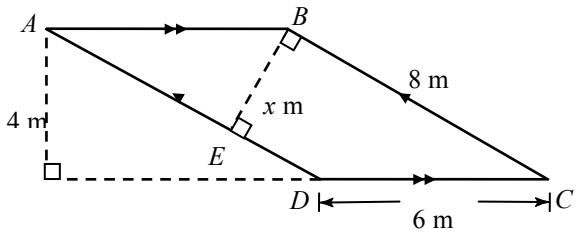
31. In the figure, BD and CE intersect at O. It is given that $\angle EOD = 47°$. Find $\angle AOB$.



(4 marks)

32. Solve $\frac{3}{2}x - 3 = 5 + \frac{1}{2}x$. (4 marks)

33. Find the value of x.



(4 marks)

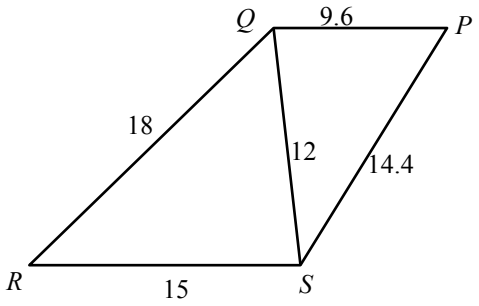
34. Find all the possible values of x in the following stem-and-leaf diagram.

Stem (10)	*Leaf (1)*
7	x 2
8	5 6 8 9
9	2 3 6

(2 marks)

35. If Carman runs at an average speed of 5 m/s, can she finish a 10 km race within 40 minutes? Explain your answer. (5 marks)

36. Refer to the figure.



(a) Prove that $\triangle QRS \sim \triangle PSQ$.

(b) Prove that $QP \parallel RS$.

(c) If $\angle QRS = 41^{\circ}$ and $\angle RSQ = 83^{\circ}$, find $\angle QPS$.

(7 marks)

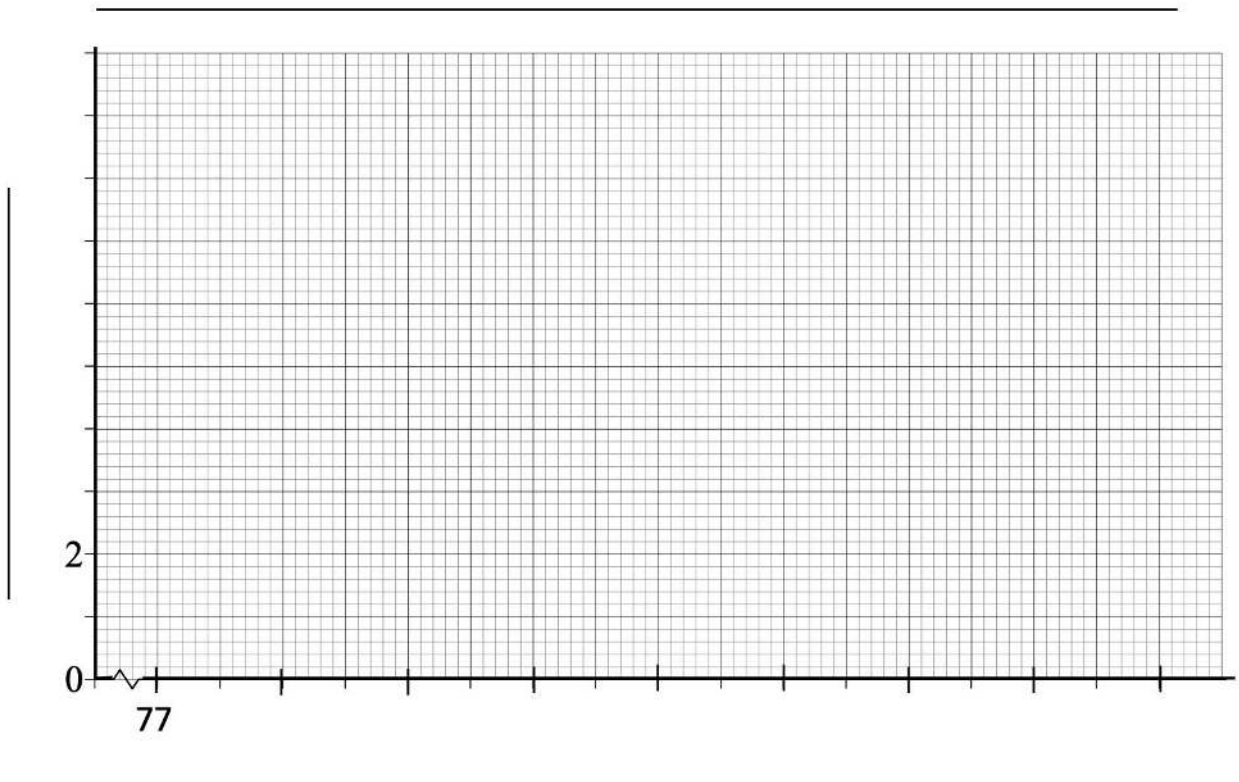
37. The following stem-and-leaf diagram shows the numbers of Chinese characters typed by some typists in a minute.

Stem (*10*)	*Leaf* (*1*)
8	3 4 5 6 7 8 9
9	1 1 2 2 2 3 4 4 5 6 6 7
10	2 4 4 6

(a) Complete the following table for the given data.

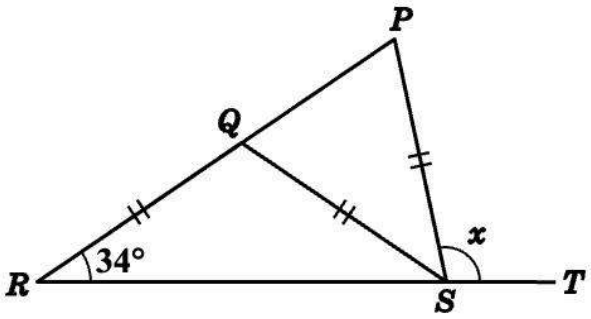
Number of characters typed	Frequency	Class mark
80–84		
85–89		
90–94		
95–99		
100–104		
105–109		

(b) Hence, construct a frequency polygon.



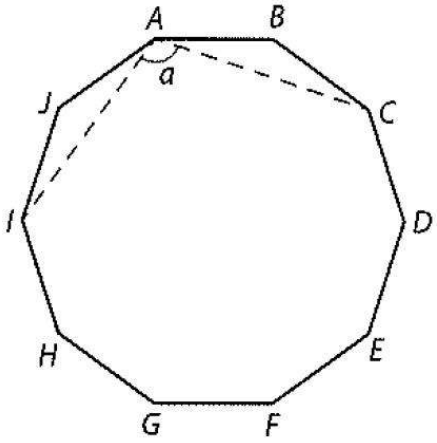
(5 marks)

38. In the figure, *RQP* and *RST* are straight lines. It is given that $RQ = QS = PS$. Find x.



(5 marks)

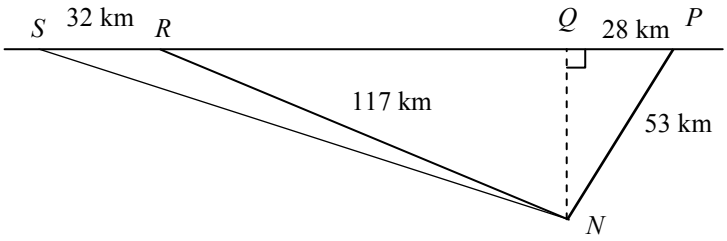
39 In the figure, *ABCDEFGHIJ* is a regular decagon. Find a.



(4 marks)

Section C (30 marks)

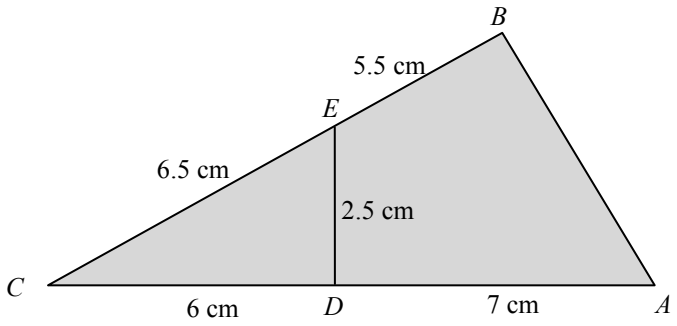
40. In the figure, $PQRS$ is a straight road and $NQ \perp PS$.



(a) Find the distance between Q and R. (5 marks)

(b) Billy drives from N to S at an average speed of 45 km/h. Can he reach S within 3 hours? Explain your answer. (5 marks)

41. In the figure, ADC and BEC are straight lines.

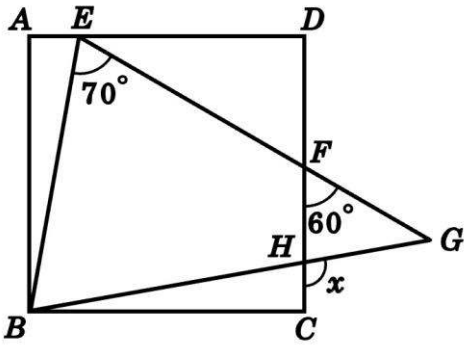


(a) Prove that $\triangle ACB \sim \triangle ECD$. (3 marks)

(b) Is $\angle ABC = 90°$? Explain your answer. (3 marks)

(c) Hence, find the area of $\triangle ACB$. (4 marks)

42. In the figure, $ABCD$ is a square. E is a point on AD. F and H are points on DC. It is given that $BG = EG$.



(a) Find x. (5 marks)

(b) Prove that $\Delta EAB \cong \Delta HCB$. Hence, prove that $EA=HC$. (5 marks)

END OF PAPER