MATHS ONLINE

By: Kru Tar

Kru Tar

Day 1

9/A*

TOP MATHS

คอร์สตะลุยโจทย์

Intensive Maths IGCSE

BOOSTER

OCT/NOV 2023

TOPMaths
A* Level

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By: Kru Tar

Cambridge Assessment International Education

Syllabus for 2023 and 2024
Cambridge IGCSE™
Mathematics 0580

Extended Paper 2 and 4

TOPMaths
A* Level

Paper 2 and 4

Number	15-20%
Algebra	35-40%
Shape and space	30-35%
Probability and Statistics	10-15%

Grade A*-E

Paper 2

1 hour 30 minutes

35%

70 marks

Short-answer questions

Paper 4

2 hours 30 minutes

65%

130 marks

Structured questions

Grade thresholds taken for Syllabus 0580 (Mathematics (without Coursework)) in the June 2023 examination.

		Minimum raw mark required for grade:						
	Maximum raw mark available	A	B	C	D	E	F	G
Component 11	56	–	–	26	21	17	13	9
Component 12	56	–	–	31	24	18	12	6
Component 13	56	–	–	32	26	21	16	11
Component 21	70	46	36	27	23	19	–	–
Component 22	70	55	44	33	26	19	–	–
Component 23	70	54	44	34	26	19	–	–
Component 31	104	–	–	45	37	29	22	15
Component 32	104	–	–	63	52	41	31	21
Component 33	104	–	–	52	44	35	27	19
Component 41	130	86	70	54	39	25	–	–
Component 42	130	93	69	45	35	25	–	–
Component 43	130	92	73	54	40	26	–	–
Component 50	90	67	57	47	38	30	21	12

The overall thresholds for the different grades were set as follows.

Option	Maximum mark after weighting	Combination of components	A*	A	B	C	D	E	F	G
AX	160	11, 31	–	–	–	71	58	46	35	24
AY	160	12, 32	–	–	–	94	76	59	43	27
AZ	160	13, 33	–	–	–	84	70	56	43	30
BX	200	21, 41	158	132	106	81	62	44	–	–
BY	200	22, 42	174	148	113	78	61	44	–	–
BZ	200	23, 43	173	146	117	88	66	45	–	–
P1	90	50	77	67	57	47	38	30	21	12

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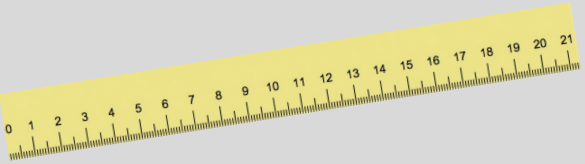
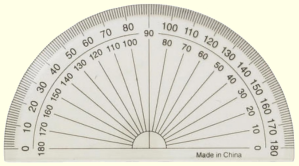
1) Ruler in cm and mm



2) Protractor

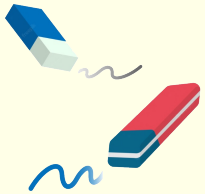


3) Pair of compasses

4) Pen (Black)

5) HB Pencil

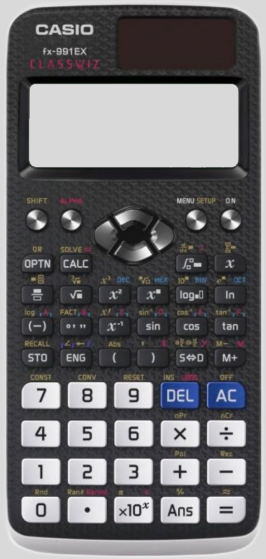
6) Eraser



7) Calculator

Casio fx-991ES Plus

Tracing paper (Provided)



Casio fx-991EX Classwiz

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Read carefully

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

Non-exact numerical answers

3 s.f.

1 d.p. for angles

2 d.p. for money

TOPICS

1.8 Set and Venn diagram
6.1 Probability
6.2 Probability from Venn diagrams
6.10 Tree diagrams
4.5 Congruence
4.6 Similarity
6.3 Averages and range
6.4 Mean of frequency table
6.5 Quartiles, Cumulative frequency and Box plots
6.6 Histograms
6.7 Pie charts
6.8 Stem and Leaf diagrams
6.9 Scatter diagrams
5.4 Vectors

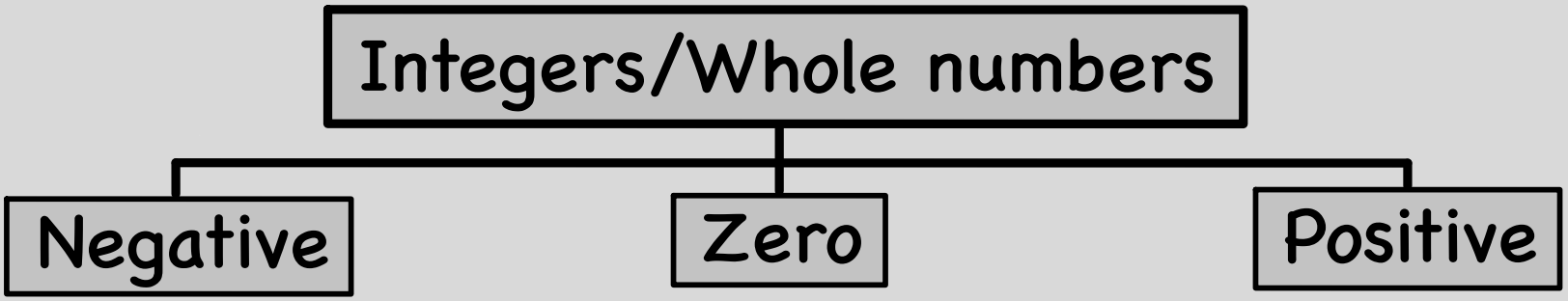
TOPMaths
A* Level

1.8 Set and Venn diagram

- Real numbers
  - Rational
    - $\frac{a}{b}$ ➡ whole number
    - b ➡ whole number
  - Irrational

NOT Real numbers

1.8 Set and Venn diagram



Non-negative integers

Square numbers

Cube numbers

Prime numbers

1.8 Set and Venn diagram

The set of ➡ { }

The set of all x such that ➡ {x: }

The number of elements in the set A ➡ n(A)

is an element of ➡ $\in$

is not an element of ➡ $\notin$

Universal set ➡ $\mathscr{E}$

The empty(null) set ➡ $\varnothing$

Union ➡ $\cup$

Intersection ➡ $\cap$

Complement ➡ A'

Not

e.g. A = {1, 2, 3}

B = {x: x is an integer}

C = {(x,y) : y = 2x+1}

D = {x: 2<x<10}

E = {a, b, c, d}

is a subset of ➡ $\subseteq$

is not a subset of ➡ $\not\subseteq$

is a proper subset of ➡ $\subset$

is not a proper subset of ➡ $\not\subset$

1.8 Set and Venn diagram

Ex. Universal sets $\mathscr{E} = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$

$A = \{ 1, 2, 3, 8 \}$ $\quad$ $C = \{ 1, 8 \}$

$B = \{ 2, 3, 6, 7 \}$ $\quad$ $D = \{ 1, 8 \}$

$n(A) = 4$

$2 \in A$

$4 \notin A$

$C \subset A$

$B \not\subset A$

$C \subseteq D$

1.8 Set and Venn diagram

Ex. Universal sets $\mathscr{E} = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$

$A = \{ 1, 2, 3, 8 \}$ $C = \{ 1, 8 \}$

$B = \{ 2, 3, 6, 7 \}$

Union (or) $A \cup B =$

Intersection (and) $A \cap B =$

Complement (Not) $A' =$

Empty/Null set $B \cap C =$

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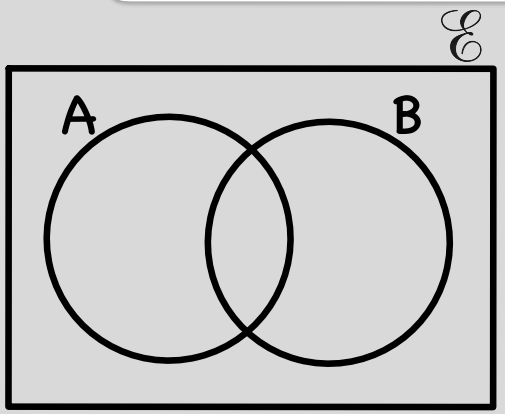
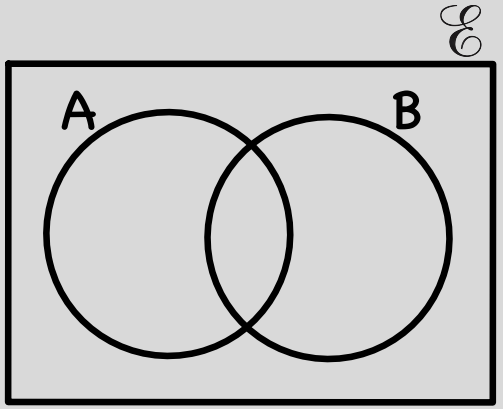
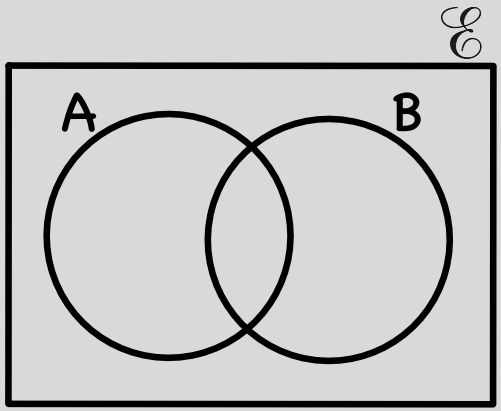
1.8 Set and Venn diagram



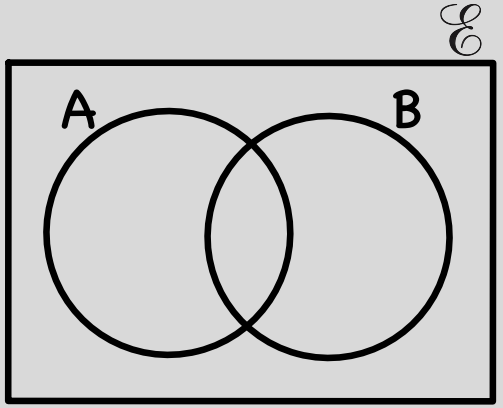
A ∪ B



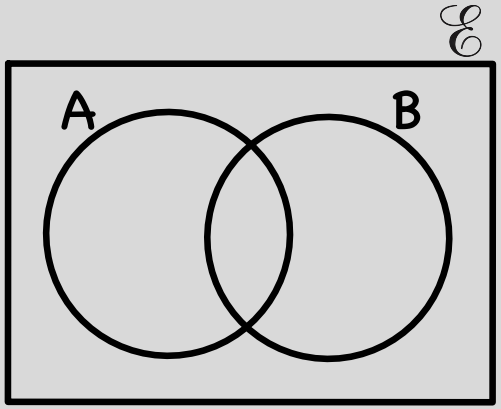
A′



A ∩ B



A ∩ B′



A ∪ B′

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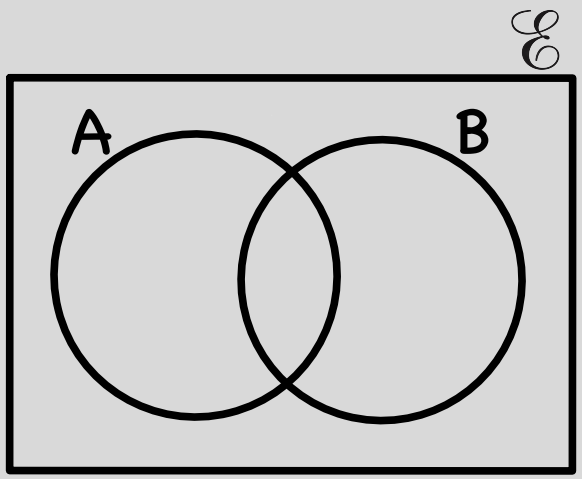
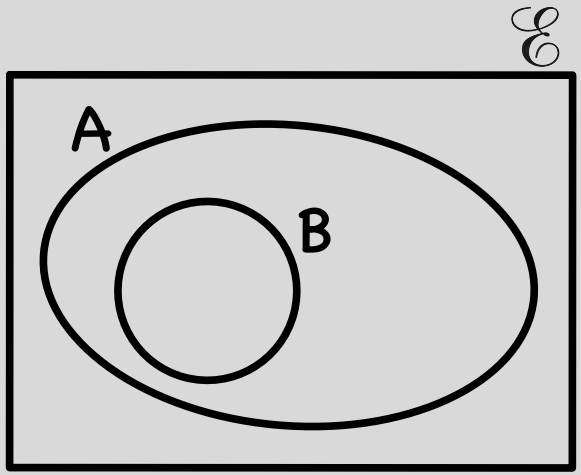
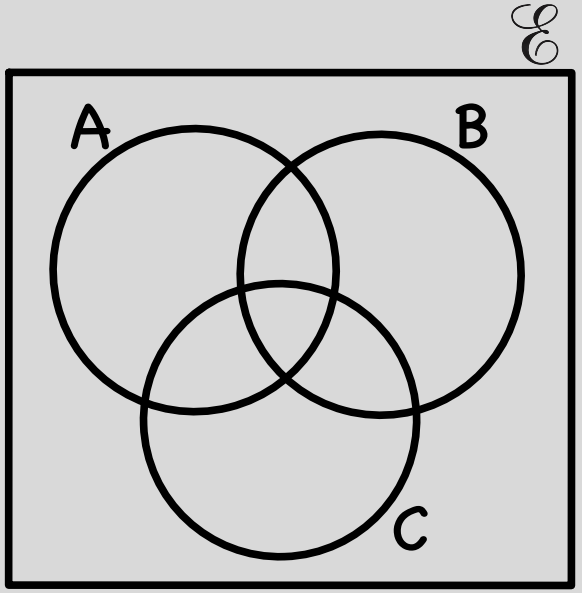
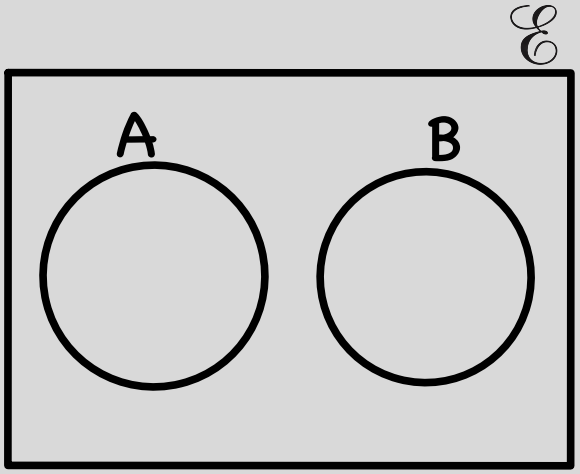
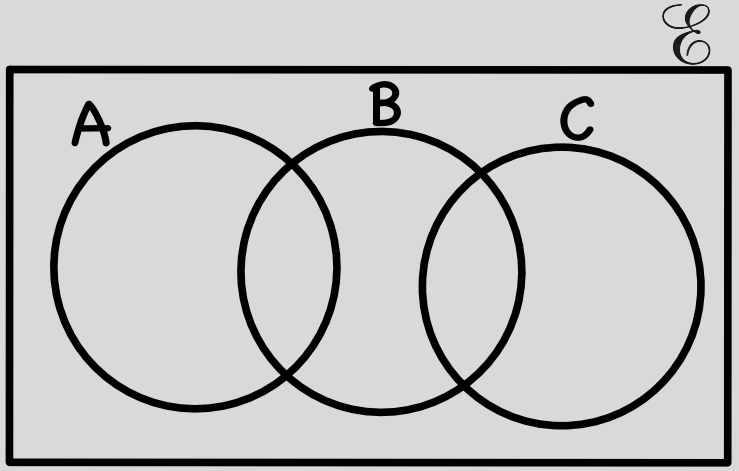
1.8 Set and Venn diagram











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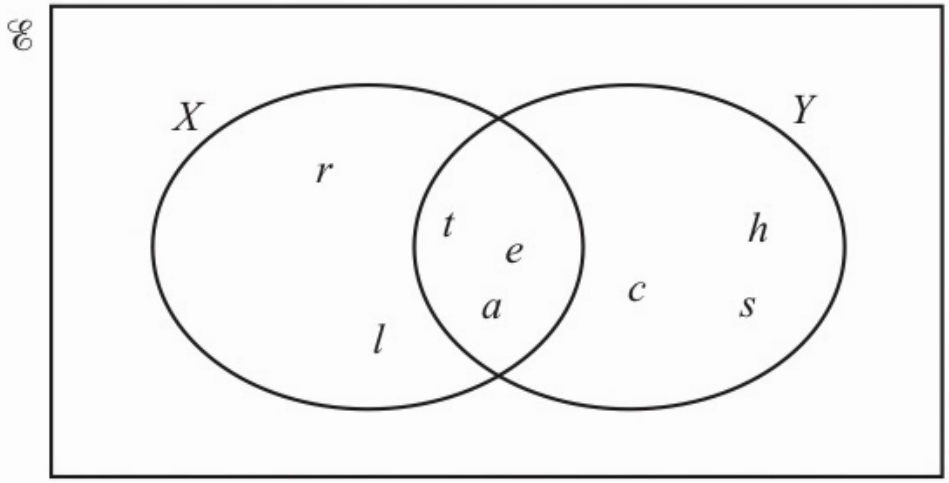
1.8 Set and Venn diagram

9 **(a)** The Venn diagram shows set X and set Y.



(i) List the elements of X.

..... [1]

(ii) Find $\mathrm{n}(Y')$.

..... [1]

6 $\mathscr{E} = \{x: 1 \leqslant x \leqslant 20\}$
$E = \{\text{even numbers}\}$
$M = \{\text{multiples of } 5\}$

(a) Find $\text{n}(M)$.

..... [1]

(b) Find the elements in the set $E \cap M$.

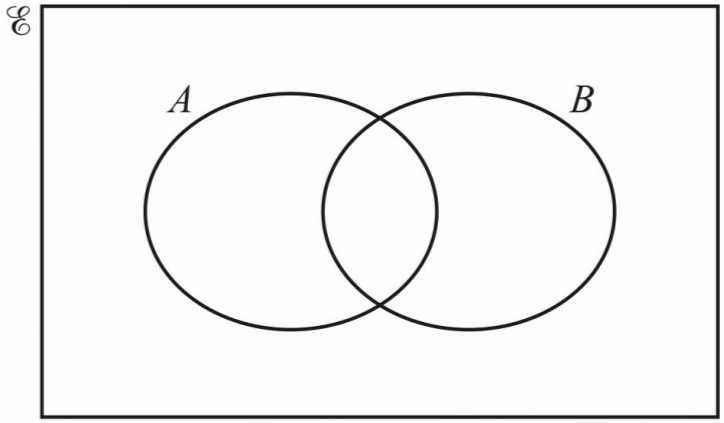
..... [1]

(c) $y \notin E$.

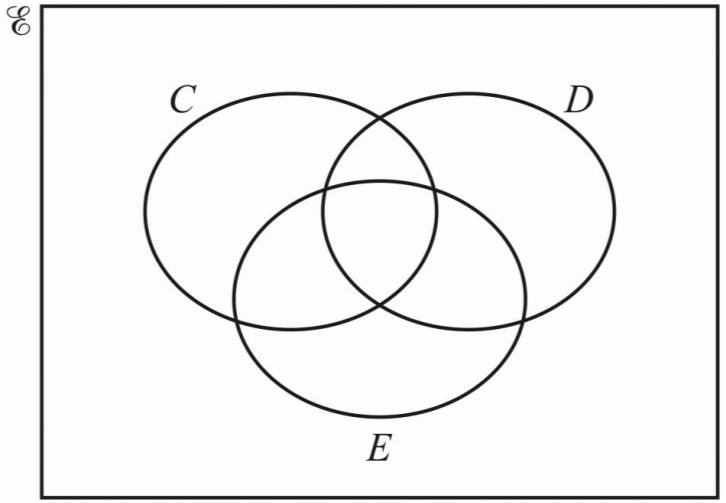
Write down a possible value of y.

..... [1]

19 In these Venn diagrams, shade the given regions.



$A' \cup B'$

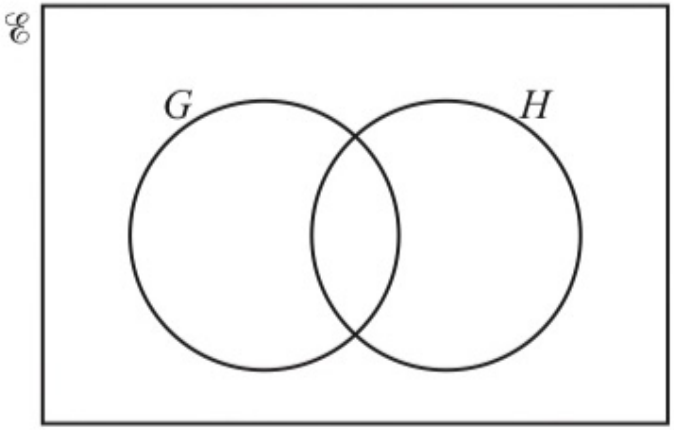


$(C \cup D) \cap E'$

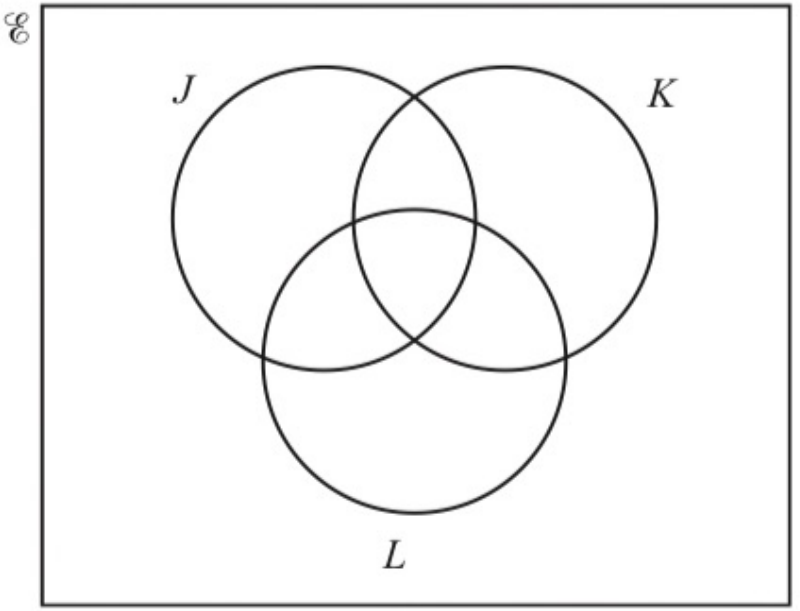
[2]

16 **(a)** Shade the region indicated in each Venn diagram.

$G \cap H'$

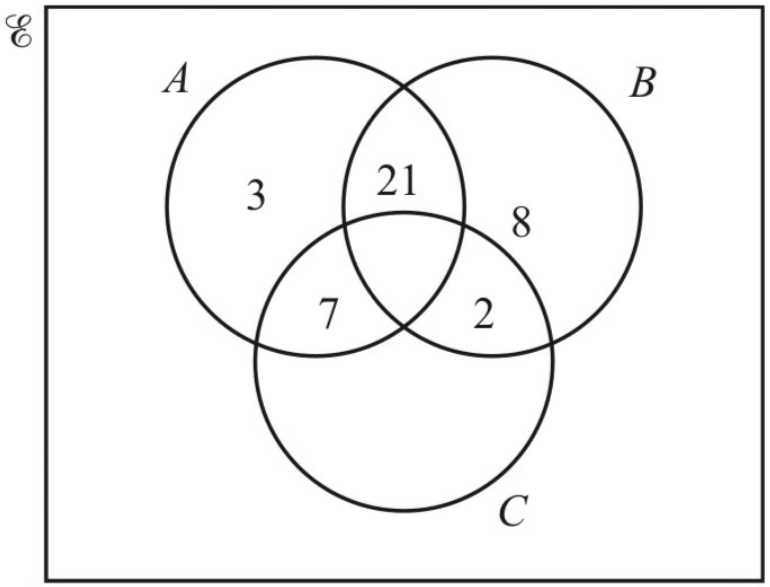


$(J \cup K') \cap L$



[2]

(b) The Venn diagram shows some information about the number of elements in sets A, B, C and $\mathscr{E}$.

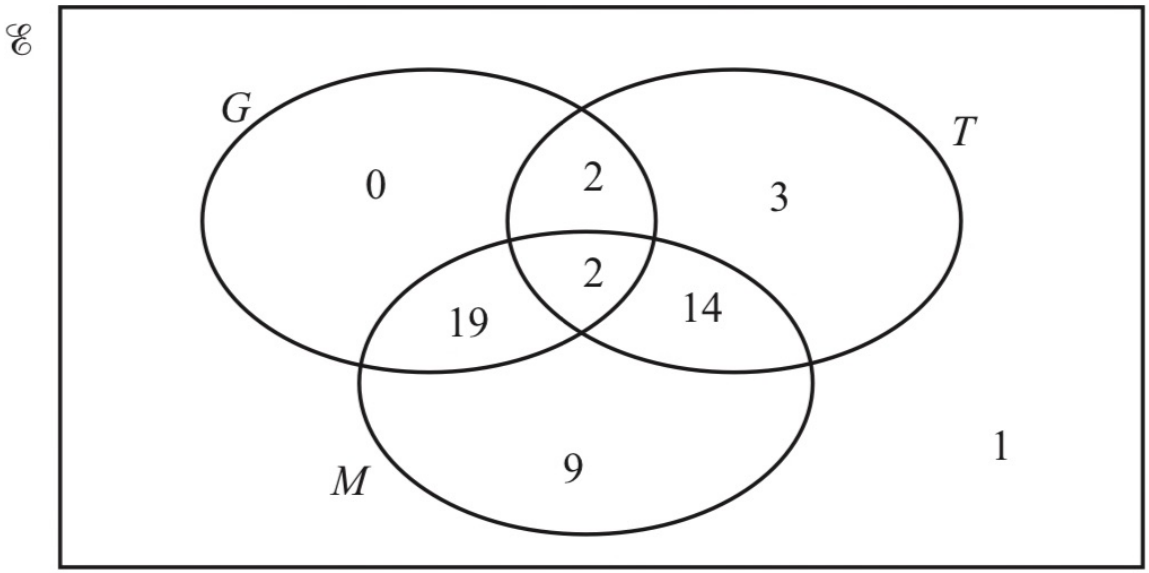


Given the following information, complete the Venn diagram.

$n(A \cap B \cap C) = 1$
$n(A \cup B \cup C)' = 17$
$n(C) = 42$

[2]

(b) The Venn diagram shows the number of students in a group of 50 students who wear glasses (G), who wear trainers (T) and who have a mobile phone (M).



(i) Use set notation to describe the region that contains only one student.

..... [1]

(ii) Find $n\left(T' \cap \left(G \cup M\right)\right)$.

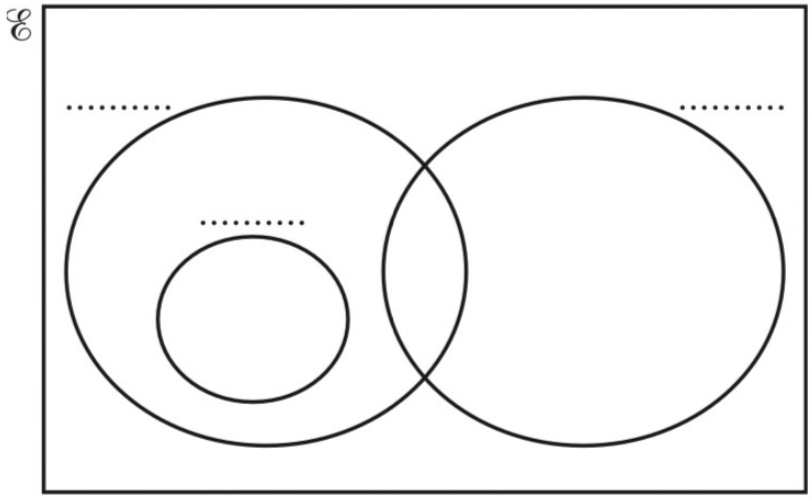
..... [1]

12 **(a)** $\mathscr{E} = \{\text{integers greater than } 2\}$
$A = \{\text{prime numbers}\}$
$B = \{\text{odd numbers}\}$
$C = \{\text{square numbers}\}$

(i) Describe the type of numbers in the set $B' \cap C$.

..... [1]

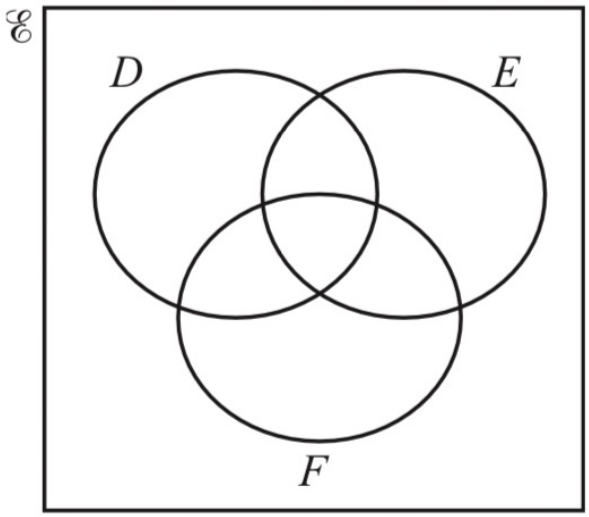
(ii) Complete the set labels on the Venn diagram.



[1]

12.

(b)



Shade the region $D' \cup (E \cap F)'$. [1]

23 $\mathscr{E} = \{0, 1, 2, 3, 4, 5, 6\}$ $A = \{0, 2, 4, 5, 6\}$ $B = \{1, 2, 5\}$

Complete each of the following statements.

$A \cap B =$ {.....}

$n(B) =$ .....

$\{0, 4, 6\} =$ ..... $\cap$ .....

$\{2, 4\}$ ..... A

[4]

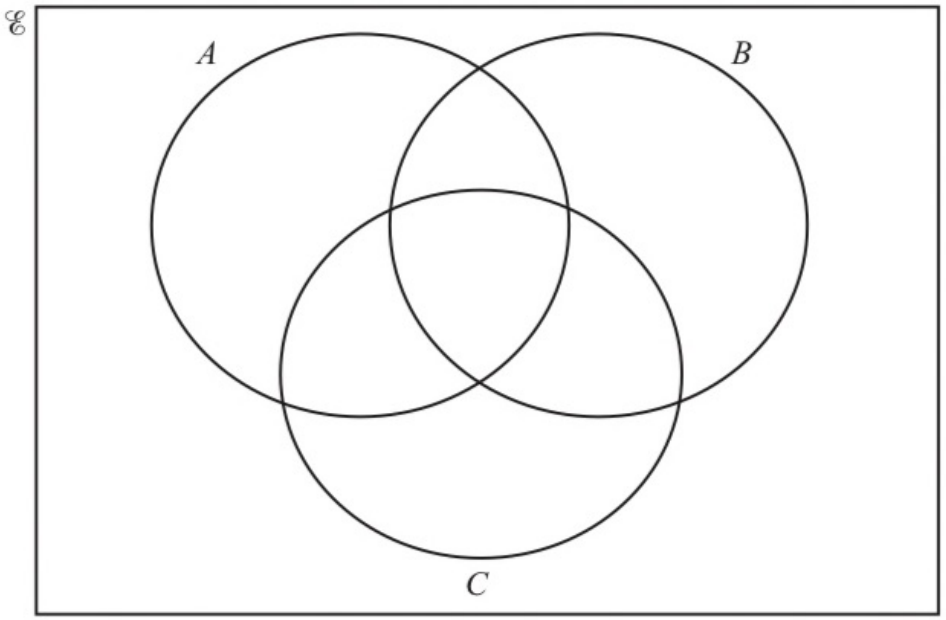
5 x is an integer.

$\mathscr{E} = \{x : 41 \leqslant x \leqslant 50\}$

$A = \{x : x \text{ is an odd number}\}$

$B = \{x : x \text{ is a multiple of } 3\}$

$C = \{x : x \text{ is a prime number}\}$



(a) Complete the Venn diagram to show this information. [3]

(b) List the elements of

(i) $A \cap C$,

..... [1]

(ii) $(B \cup C)'$.

..... [1]

(c) Find $\text{n}(A \cap B \cap C)$.

..... [1]

18 **(a)** $M = \{x : x \text{ is an integer and } 2 \leqslant x < 6\}$

(i) Find n(M).

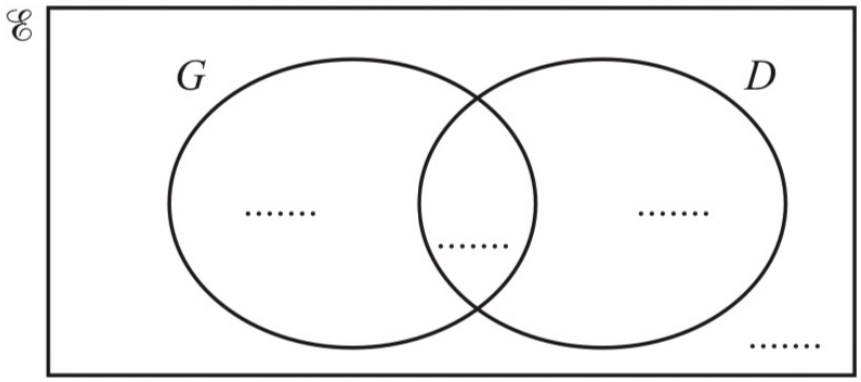
..... [1]

(ii) Write down a set N where $N \subset M$ and $N \neq \varnothing$.

{.....} [1]

19 **(a)** In a class of 40 students:

- 28 wear glasses (G)
- 13 have driving lessons (D)
- 4 do not wear glasses and do not have driving lessons.

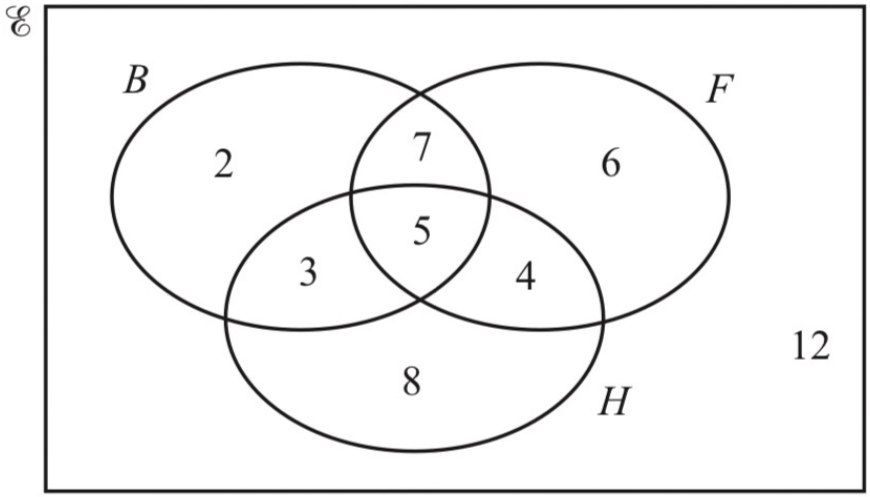


(i) Complete the Venn diagram. [2]

(ii) Use set notation to describe the region that contains a total of 32 students.

..... [1]

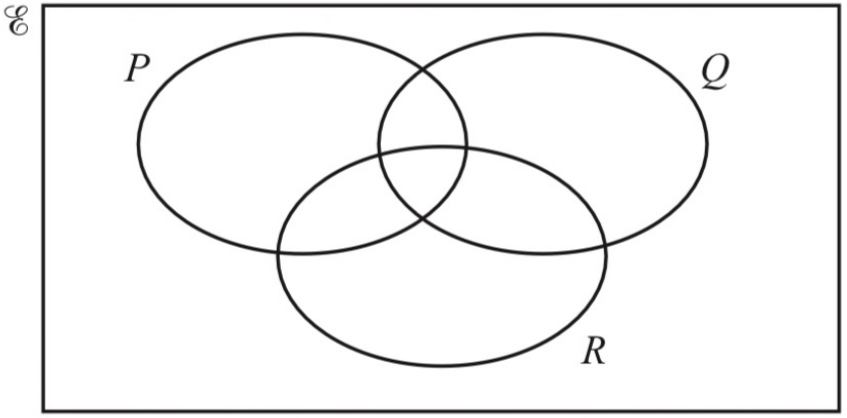
19 (b) This Venn diagram shows information about the number of students who play basketball (B), football (F) and hockey (H).



Find $n((B \cup F) \cap H')$.

..... [1]

(c)



Shade the region $P \cup (Q \cap R)'$. [1]

6.1 Probability

1) An **experiment** is a repeatable process that gives rise to a number of outcomes.

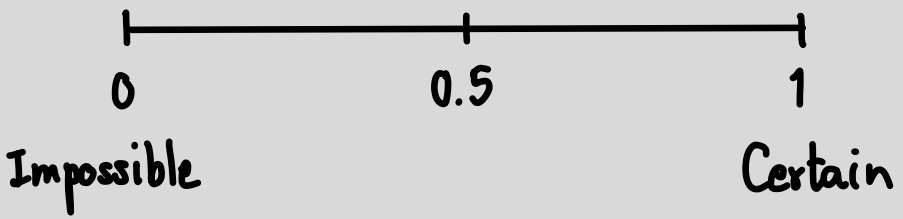
2) A **sample space** is the set of all possible outcomes of an experiment.

3) An **event** is a collection of one or more outcomes.

4) The **probability** of an event is the chance that the event will occur as a result of an experiment.

5) Where outcomes are **equally likely** the probability of an event is the number of outcomes in the event divided by the total number of possible outcomes in the sample space.

$$\text{Probability} = \frac{n(E)}{n(S)}$$



Conditional probability

Tossing a fair dice. 1, 2, 3, 4, 5, 6

Probability that getting 5 is

Given that a dice shown an odd number,

the probability of getting 5 is

6.1 Probability

15 A bag contains 5 green buttons, 2 blue buttons and 6 white buttons.
Maya takes two buttons at random from the bag, without replacement.

Calculate the probability that one button is green and the other button is not green.

..... [3]

23 Bag A and bag B each contain red sweets and yellow sweets.
Anna picks a sweet at random from bag A.
Ben picks a sweet at random from bag B.
The probability that Anna picks a red sweet is $\frac{2}{5}$.
The probability Anna and Ben both pick a yellow sweet is $\frac{1}{10}$.

Find the probability that Anna and Ben both pick a red sweet.

..... [3]

5 The table shows the relative frequency of the games won by a football team.

Result of game	won	lost	drawn
Relative frequency	0.1		

The number of games lost is twice the number of games drawn.

Complete the table.

[3]

1 The probability that Jane wins a game is $\frac{7}{10}$.

(a) Find the probability that Jane does not win the game.

..... [1]

(b) Jane plays this game 50 times.

Find the number of times she is expected to win the game.

..... [1]

7 A spinner has five sides.
Each side is painted red, blue, green, yellow or orange.
The table shows some of the probabilities of the spinner landing on each colour.

Colour	Red	Blue	Green	Yellow	Orange
Probability	0.3	0.16	0.18	0.25	

(a) Complete the table. [2]

(b) Dan spins the spinner once.

Find the probability that the spinner lands on red or blue.

..... [2]

6.2 Probability from Venn diagrams

OR	Union	$A \cup B$
AND	Intersection	$A \cap B$
NOT	Complement	A'

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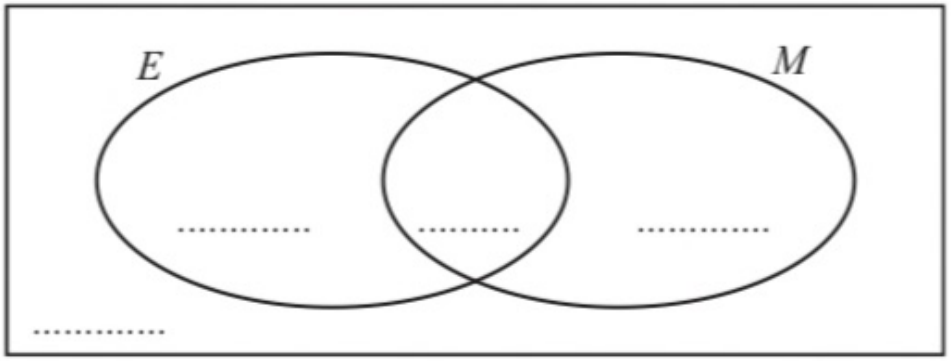
6.2 Probability from Venn diagrams

8 (c) 50 students are asked if they like English (E) and if they like mathematics (M).
3 say they do not like English and do not like mathematics.
33 say they like English.
42 say they like mathematics.

(i) Complete the Venn diagram. [2]



(ii) A student is chosen at random.

Find the probability that this student likes English and likes mathematics.

..... [1]

(iii) Two students are chosen at random.

Find the probability that they both like mathematics.

..... [2]

(iv) Two students who like English are chosen at random.

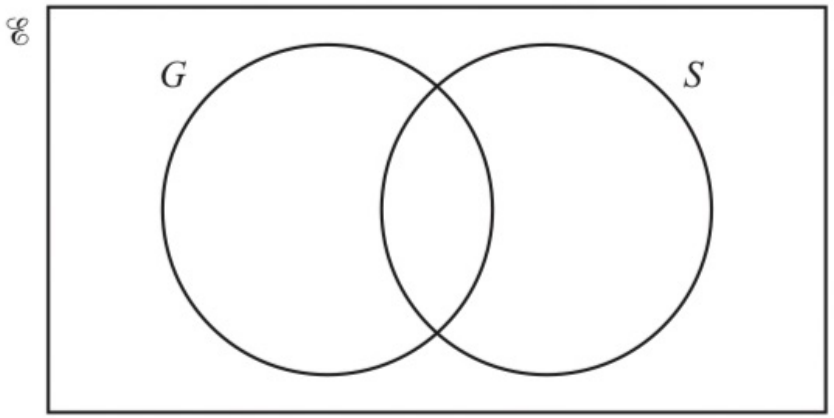
Find the probability that they both also like mathematics.

..... [2]

pg 41

9 **(a)** There are 32 students in a class.

5 do not study any languages.
15 study German (G).
18 study Spanish (S).



(i) Complete the Venn diagram to show this information. [2]

(ii) A student is chosen at random.

Find the probability that the student studies Spanish but not German.

..... [1]

(iii) A student who studies German is chosen at random.

Find the probability that this student also studies Spanish.

..... [1]

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6.10 Tree diagrams

Ex. A bag contains 5 red balls and 3 green balls. A ball is drawn at random and then replaced. Another ball is drawn. What is the probability that both balls are green? with replacement

6.10 Tree diagrams

RRRRR
GGG

Ex. A bag contains 5 red and 3 green balls. A ball is selected at random and not replaced. A second ball is then selected. Find the probability of selecting:

a) two green balls

b) one red ball and one green ball

c) at least one green balls.

without replacement

6.10 Tree diagrams

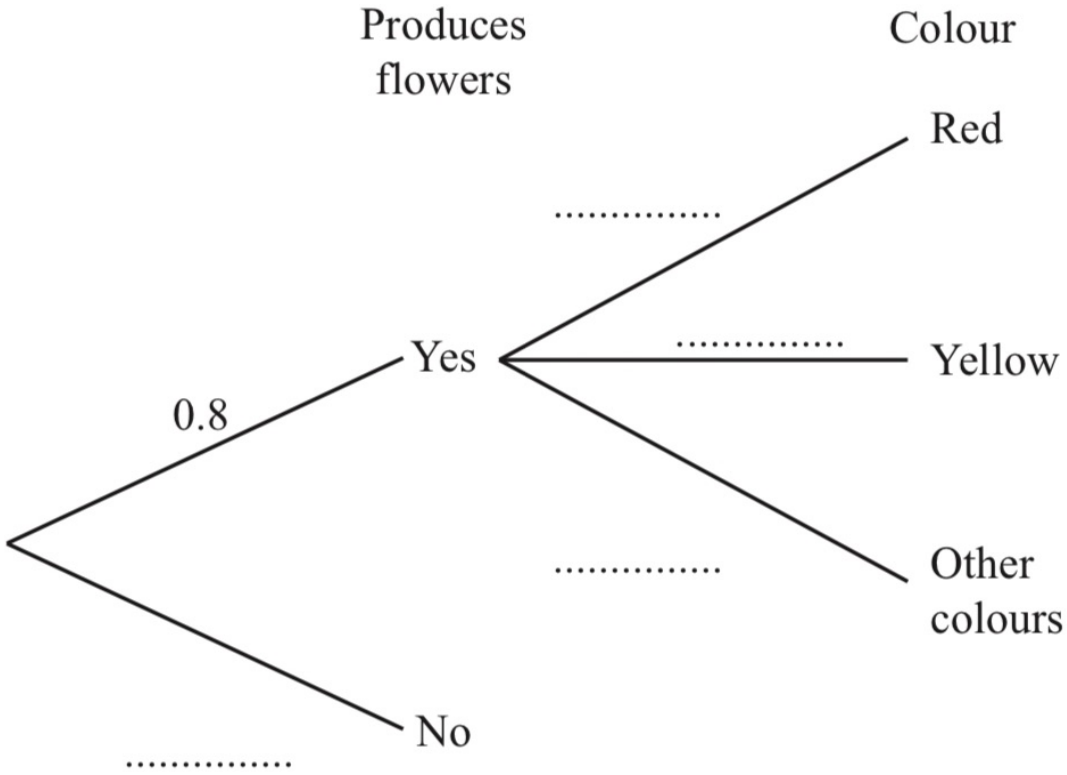
7 Tanya plants some seeds.
The probability that a seed will produce flowers is 0.8 .
When a seed produces flowers, the probability that the flowers are red is 0.6 and the probability that the flowers are yellow is 0.3 .

(a) Tanya has a seed that produces flowers.

Find the probability that the flowers are not red and not yellow.

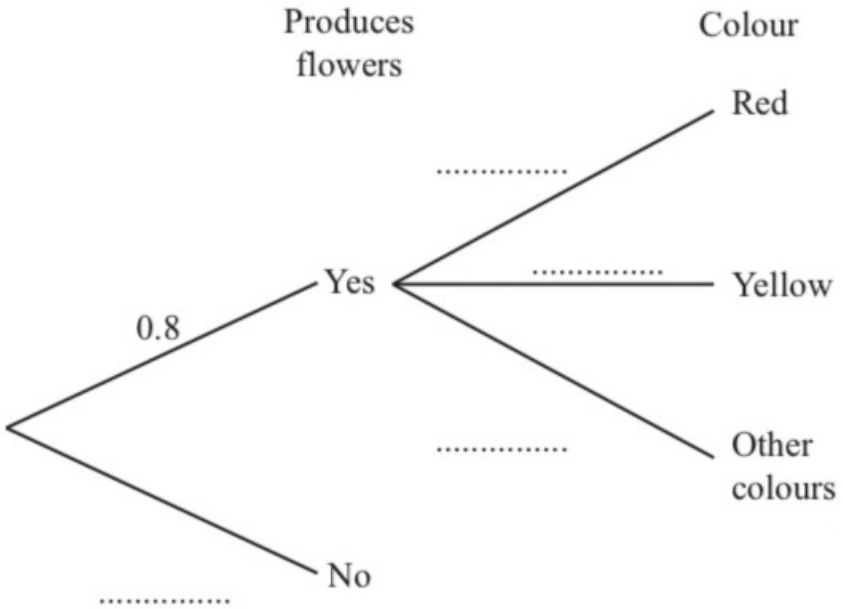
..... [1]

(b) **(i)** Complete the tree diagram.



[2]

7



(ii) Find the probability that a seed chosen at random produces red flowers.

..... [2]

(iii) Tanya chooses a seed at random.

Find the probability that this seed does not produce red flowers and does not produce yellow flowers.

..... [3]

(c) Two of the seeds are chosen at random.

Find the probability that one produces flowers and one does not produce flowers.

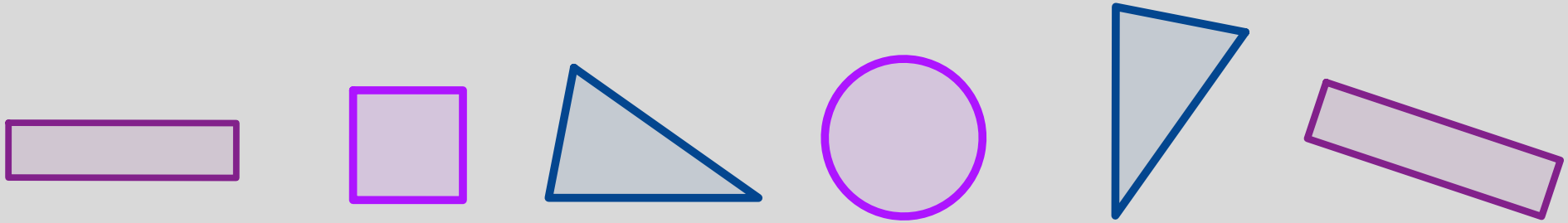
..... [3]

MATHS ONLINE

By: Kru Tar

4.5 Congruence

Same shape, same size, fit exactly or identical.



✓ Translation, Rotation, Reflection

✗ Enlargement

MATHS ONLINE

By: Kru Tar

Congruent triangles

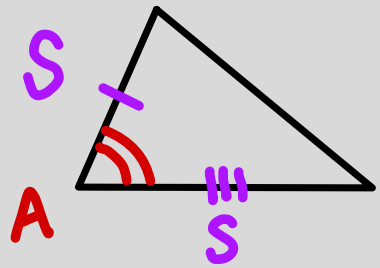
S = Side

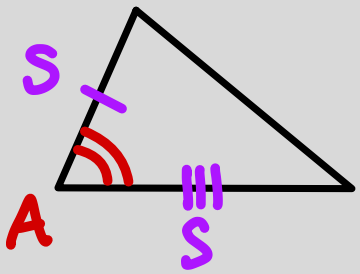
A = Angle

R = Right angle

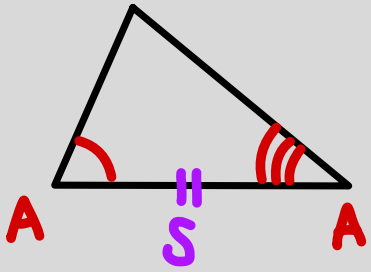
H = Hypotenuse

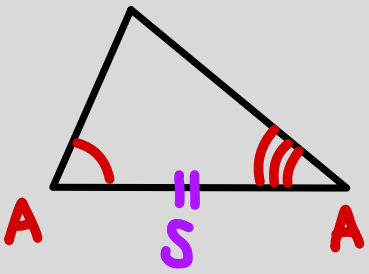
1) SAS



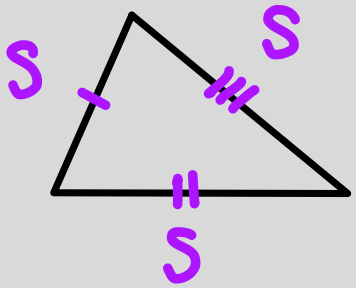


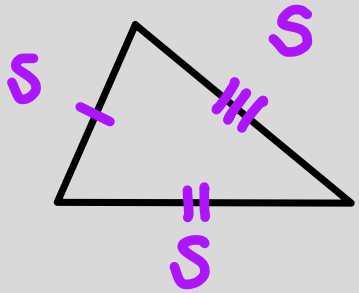
2) ASA



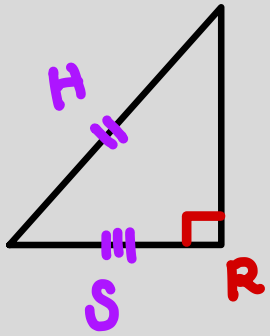


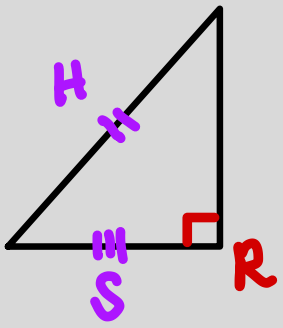
3) SSS





4) RHS



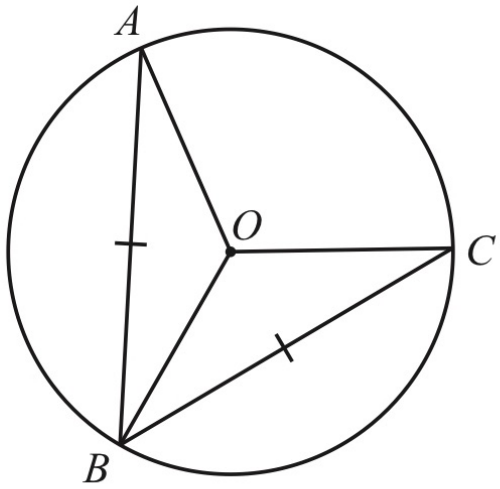


TOPMaths

A* Level

4.5 Congruence

12 (a)



NOT TO SCALE

AO, OB and OC are all radii of the circle.
$AB = BC$.
Therefore triangle AOB is congruent to triangle COB.

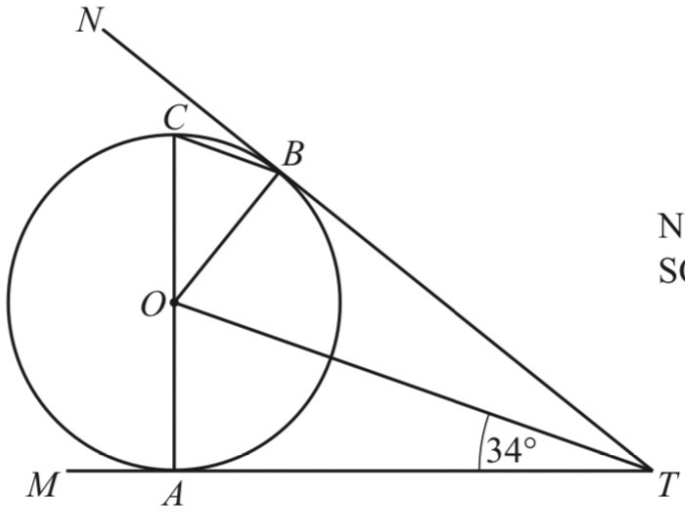
Draw a ring around the correct criterion for this statement.

SAS *RHS* *SSS* *ASA*

[1]

4. (c) A, B and C lie on a circle, centre O, with diameter AC.
TAM and TBN are tangents to the circle and angle $ATO = 34°$.

Using values and geometrical reasons, complete these statements to show that CB is parallel to OT.



NOT TO SCALE

In triangles AOT and BOT, OT is common.
Angle OAT = angle OBT = 90° because .....

.....

$AT = BT$ because .....

.....

Triangle AOT is congruent to triangle BOT because of congruence criterion .....

Angle AOT = angle BOT = 56° because angles in a triangle add up to 180°.

Angle BOC = ... ° because .....

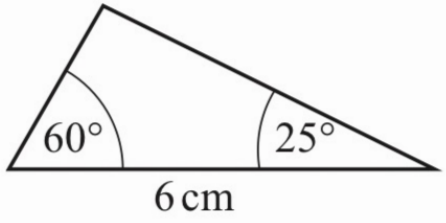
Angle OBC = ... ° because .....

.....

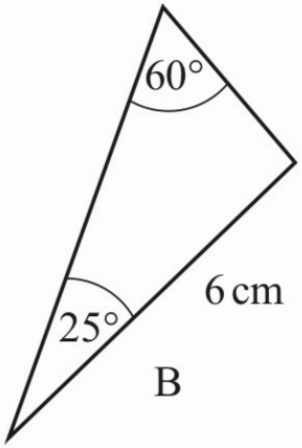
CB is parallel to OT because .....

[6]

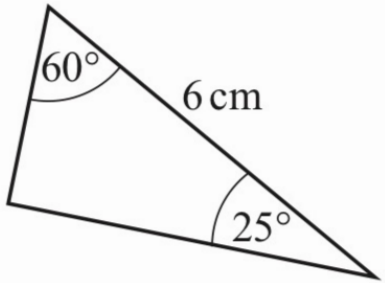
9 The diagram shows three triangles A, B and C.



A



B



C

NOT TO SCALE

(a) Which two of the triangles A, B and C are congruent with each other?

..... [1]

(b) Draw a ring around the congruence criterion that can be used to support your answer to **part (a)**.

SSS ASA SAS RHS

[1]

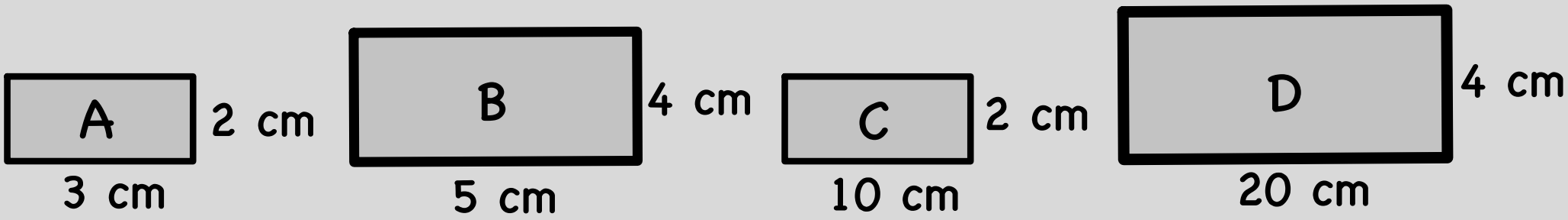
MATHS ONLINE

By: Kru Tar

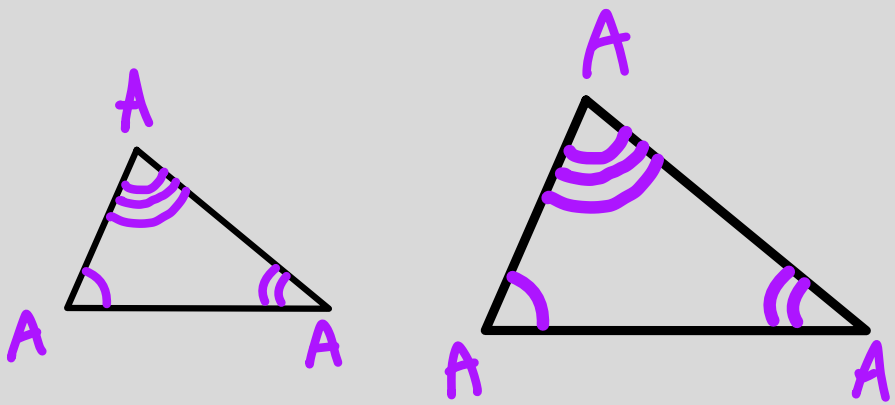
4.6 Similarity

Same shape. Corresponding sides are in proportion.

✓ Enlargement



Similar triangles ➡ AAA



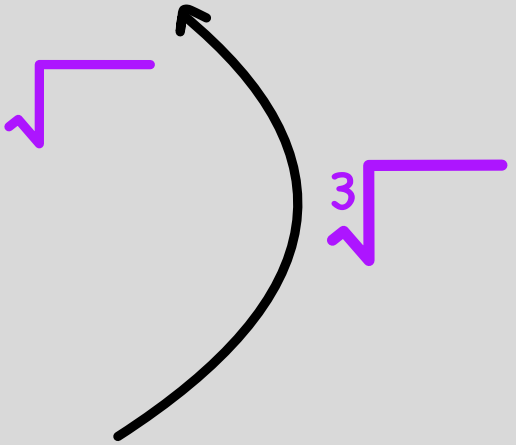
MATHS ONLINE

By: Kru Tar

4.6 Similarity

Scale factor

Length	$a : b$	$\times k$
Area	$a^2 : b^2$	$\times k^2$
Volume	$a^3 : b^3$	$\times k^3$



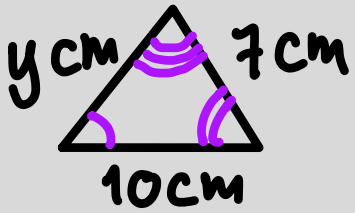
MATHS ONLINE

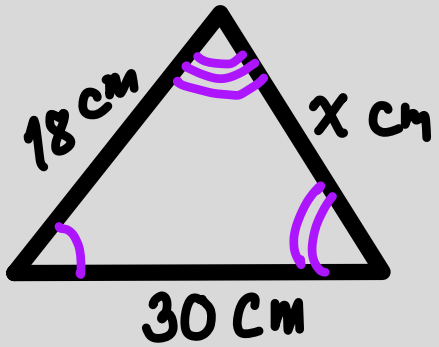
By: Kru Tar

4.6 Similarity

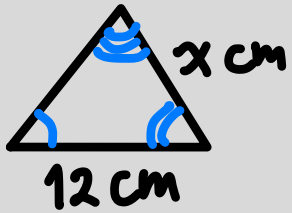
Length	a : b	x k

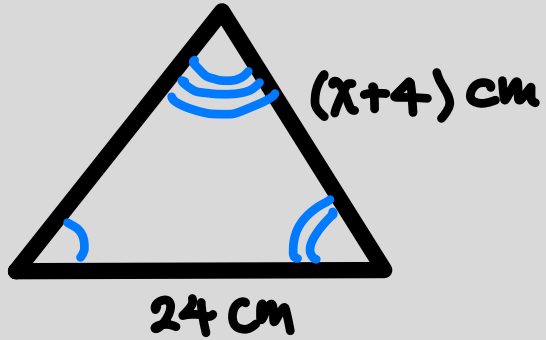
Ex.





Ex.





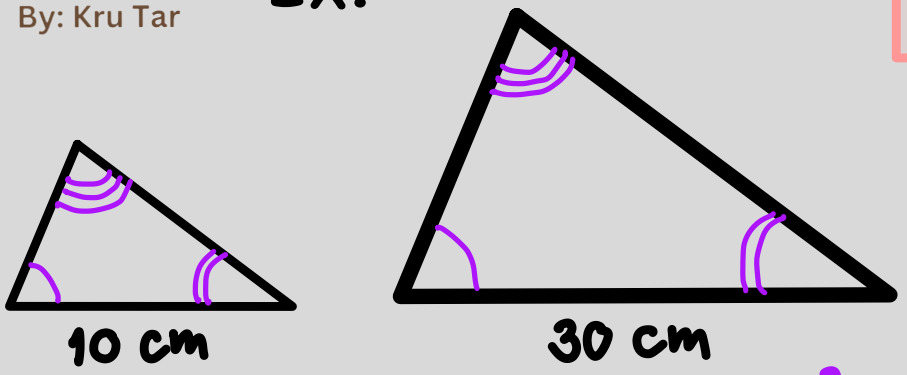
MATHS ONLINE

By: Kru Tar

4.6 Similarity

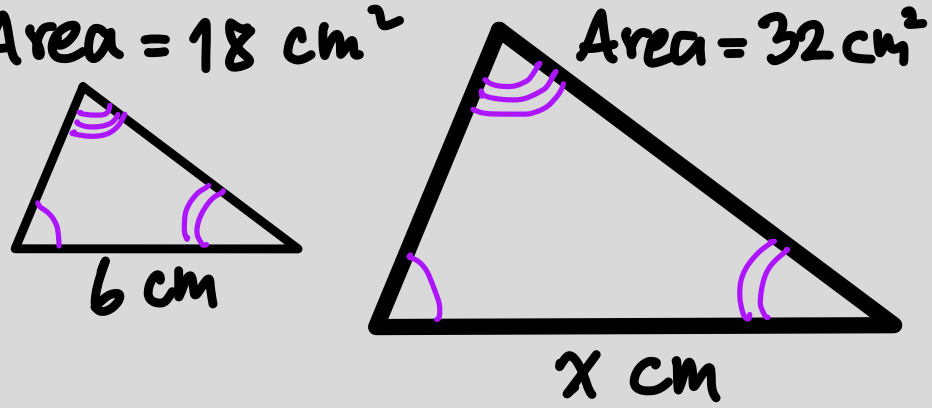
Length	a : b	x k
Area	$a^2 : b^2$	x k^2

Ex.



Area = 9 cm^2 Area = x cm^2

Ex.



MATHS ONLINE

By: Kru Tar

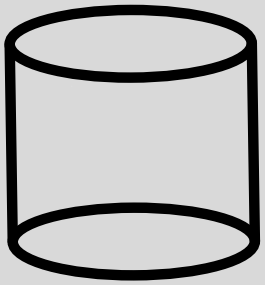
4.6 Similarity

Length	$a : b$	$\times k$
Volume	$a^3 : b^3$	$\times k^3$

$\sqrt[3]{\ }$

Ex.

$V = 30\ cm^3$

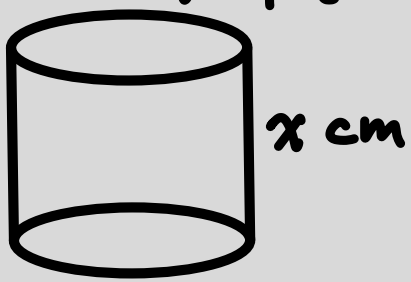


$V = x\ cm^3$

Ex.

$V = 32\ cm^3$

$V = 108\ cm^3$



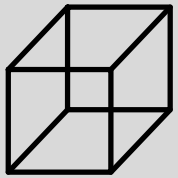
MATHS ONLINE

By: Kru Tar

4.6 Similarity

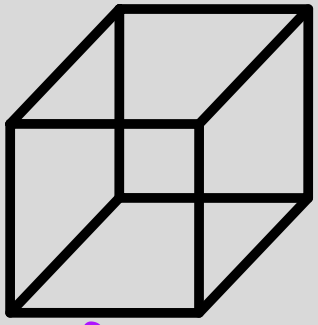
Length	$a : b$	$\times k$
Area	$a^2 : b^2$	$\times k^2$
Volume	$a^3 : b^3$	$\times k^3$

Ex.



Surface Area
$= 9\ cm^2$

Volume $= 81\ cm^3$



Surface area
$= 16\ cm^2$

Volume $= x\ cm^3$

4.6 Similarity

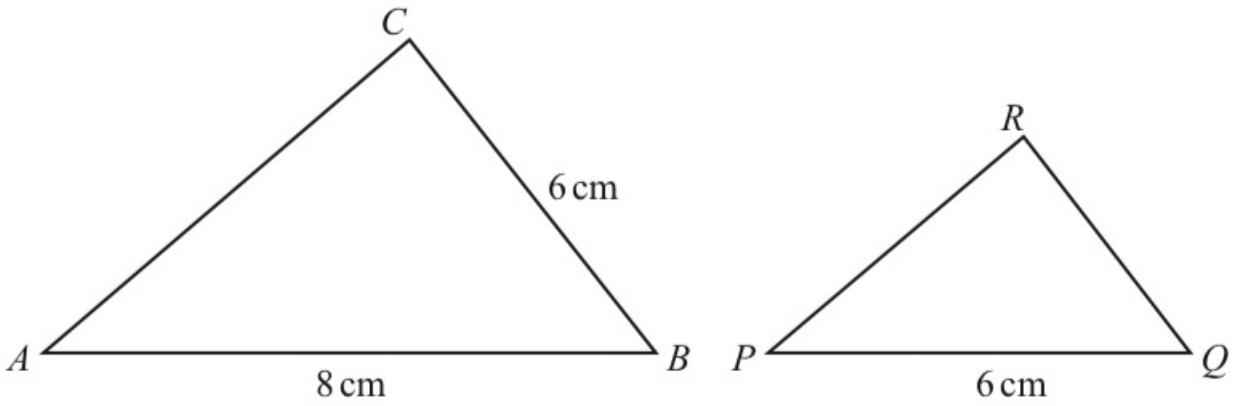
13 On a map, a lake has an area of 32 cm^2.
The scale of the map is 1 : 24 000.

Calculate the actual area of the lake.
Give your answer in km^2.

..... km^2 [2]

Pg57

11



NOT TO SCALE

Triangle ABC is mathematically similar to triangle PQR.

(a) Calculate QR.

$QR =$ ..... cm [2]

(b) The two triangles are the cross-sections of two mathematically similar prisms.
The volume of the larger prism is $320\,cm^3$.

Calculate the volume of the smaller prism.

..... cm^3 [2]

Pg 58

20 A model of a statue has a height of 4 cm.
The volume of the model is 12 cm^3.
The volume of the statue is 40 500 cm^3.

Calculate the height of the statue.

..... cm [3]

Pg 58

7 Two rectangular picture frames are mathematically similar.

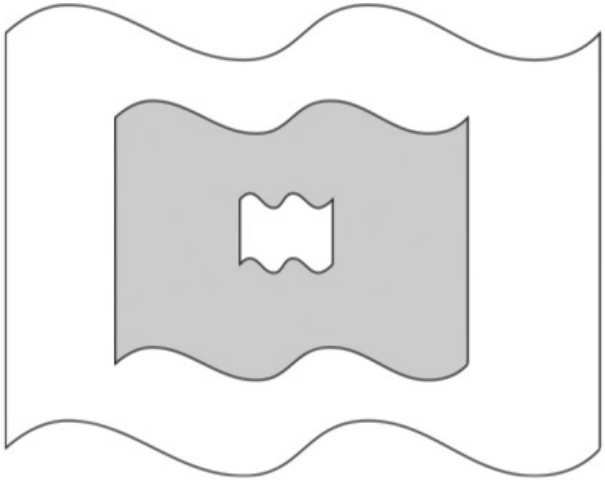
(a) The areas of the frames are 350 cm^2 and 1134 cm^2.
The width of the smaller frame is 17.5 cm.

Calculate the width of the larger frame.

..... cm [3]

Pg 58

15



NOT TO SCALE

The diagram shows three shapes that are mathematically similar.
The heights of the shapes are in the ratio small : medium : large = 1 : 5 : 8.

Find the ratio shaded area : total unshaded area.
Give your answer in its simplest form.

..... : ..... [4]

6.3 Averages and range

1) Range = Max - Min

2) Mean = $\frac{\text{Sum}}{N} = \frac{\Sigma x}{N} = \frac{\Sigma fx}{N}$

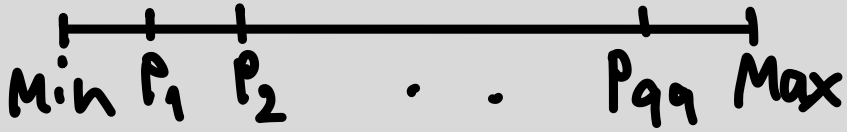
3) Median = Middle (Ordered data) $\frac{N}{2}$ and next

4) Mode = Most common or popular

5) Lower quartile
6) Upper quartile

7) Interquartile range = UQ - LQ

8) The n^{th} percentile



6.3 Averages and range

Ex. a) 3, 4, 6, 2, 8, 8, 5

1) Mean

2) Median

3) Mode

4) Range

5) LQ

6) UQ

7) IQR

8) The 60th percentile

6.3 Averages and range

Ex. b) 13, 26, 22, 30, 32, 48, 29, 27, 26, 32

1) Mean

2) Median

3) Mode

4) Range

5) LQ

6) UQ

7) IQR

8) The 60th percentile

Combining means

Set 1 size $= n_1$, mean $= \bar{x}_1$, sum $= n_1\bar{x}_1$

Set 2 size $= n_2$, mean $= \bar{x}_2$, sum $= n_2\bar{x}_2$

$$\text{Combining means} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$$

Ex. The mean of a group of 25 observations is 6.4. The mean of a second group of 30 observations is 7.2. Calculate the mean of all 55 observations.

6.3 Averages and range

Pg 66

4 The mean mass of four men in a rowing team is 97.5 kg.
The modal mass is 101 kg.
The range of the masses is 8 kg.

Find the mass of each of the four men.

..... kg , ... kg , ... kg, ... kg [3]

Pg 67

4

(b) Petra records the score in each test she takes.

The mean of the first n scores is x.
The mean of the first $(n - 1)$ scores is $(x + 1)$.

Find the nth score in terms of n and x.
Give your answer in its simplest form.

..... [3]

Pg 68

8

(c) A dice is rolled 100 times.
The frequency table shows the results.

Score	1	2	3	4	5	6
Frequency	16	25	17	19	8	15

Find

(i) the range,

..... [1]

(ii) the mode,

..... [1]

(iii) the median.

..... [1]