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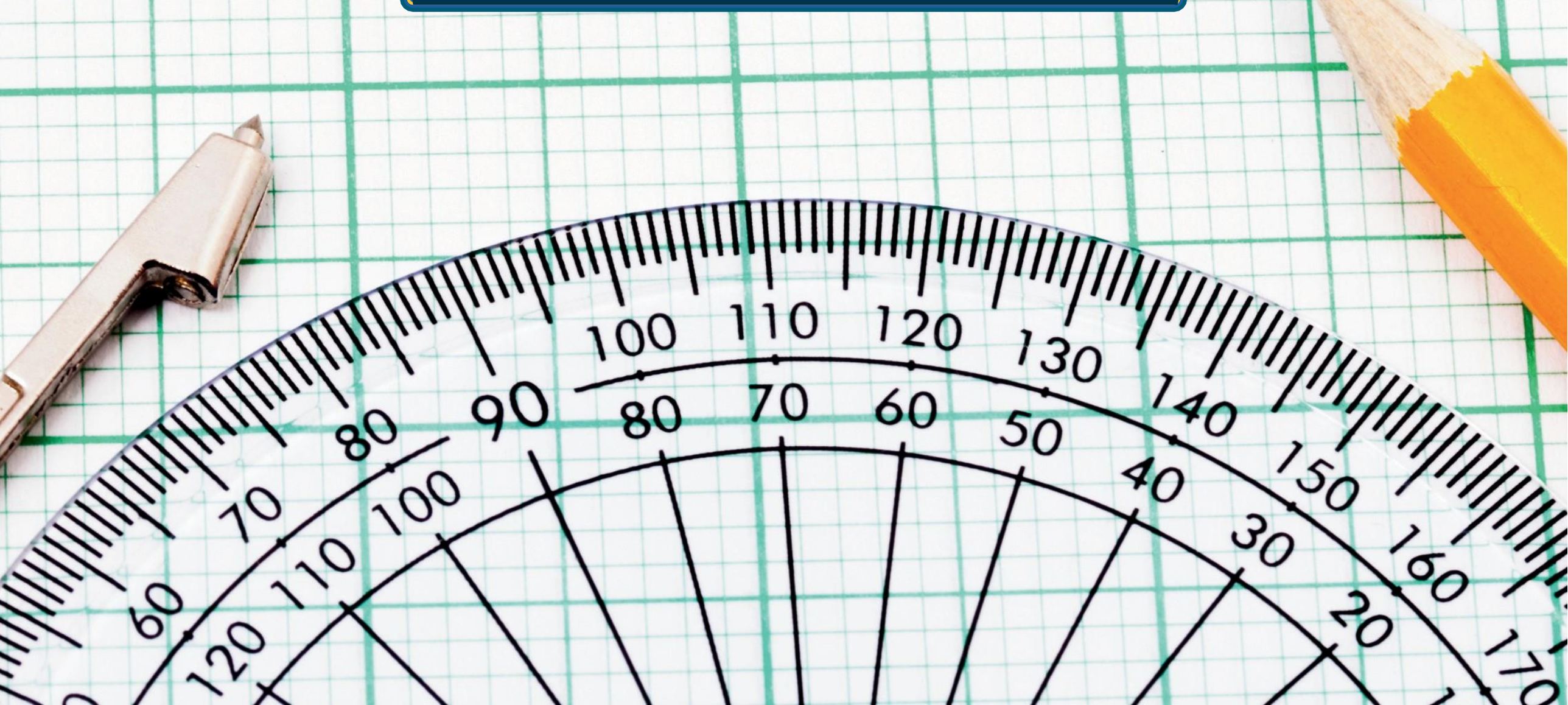
ELEVATE

MATH TOPICAL WORKSHEETS

Numbers and Algebra



1 p is directly proportional to $(q+2)^2$.
When $q=1$, $p=1$.

Find p when $q=10$.

$p =$ .....

(3 marks)

2 Simplify.

$$\frac{5}{3x} \times \frac{9x}{20}$$

(2 marks)

3 Show that $\dfrac{\sqrt{8}}{\sqrt{8}-2}$ can be written in the form $n + \sqrt{n}$, where n is an integer.

Show your working clearly.

(3 marks)

4 $\mathrm{j}(x) = 5^x$.

Find x when $\mathrm{j}^{-1}(x) = 2$.

$x =$ .....

(1 mark)

5 The value of a gold ring increases exponentially at a rate of 5% per year. The value is now $882.

i) Calculate the value of the ring 2 years ago.

$ ..... [2]

ii) Find the number of complete years it takes for the ring's value of $882 to increase to a value greater than $1100.

[2]

(4 marks)

6 Make *y* the subject of the formula

$$t = \frac{2 - 3y}{y + 2}$$

(4 marks)

7 Sasha takes a music exam.

The table shows the result that Sasha can get for different percentages in her music exam.

Percentage	Result
50% - 69%	Pass
70% - 84%	Merit
85% - 100%	Distinction

Sasha gets 62 out of 80 in her music exam.

What result does Sasha get?
You must show your working.

(2 marks)

8 Brad travelled from his home in New York to Chamonix.

- He left his home at 16 30 and travelled by taxi to the airport in New York.
  This journey took 55 minutes and had an average speed of 18 km/h.

- He then travelled by plane to Geneva, departing from New York at 22 15.
  The flight path can be taken as an arc of a circle of radius 6400 km with a sector angle of 55.5 °.
  The local time in Geneva is 6 hours ahead of the local time in New York.
  Brad arrived in Geneva at 11 25 the next day.

- To complete his journey, Brad travelled by bus from Geneva to Chamonix.
  This journey started at 13 00 and took 1 hour 36 minutes.
  The average speed was 65 km/h.
  The local time in Chamonix is the same as the local time in Geneva.

Find the overall average speed of Brad's journey from his home in New York to Chamonix.
Show all your working and give your answer in km/h.

. .....km/h

(11 marks)

9 Find the highest common factor (HCF) of 84 and 105.

(2 marks)

10 Factorise.

$$12x + 15$$

(1 mark)

11 0, 1, 1, 2, 3, 5, 8, 13, 21 , ...

This sequence is a Fibonacci sequence. After the first two terms, the rule to find the next term is “add the two previous terms”. For example, 5 + 8 = 13.

Use this rule to complete each of the following Fibonacci sequences.

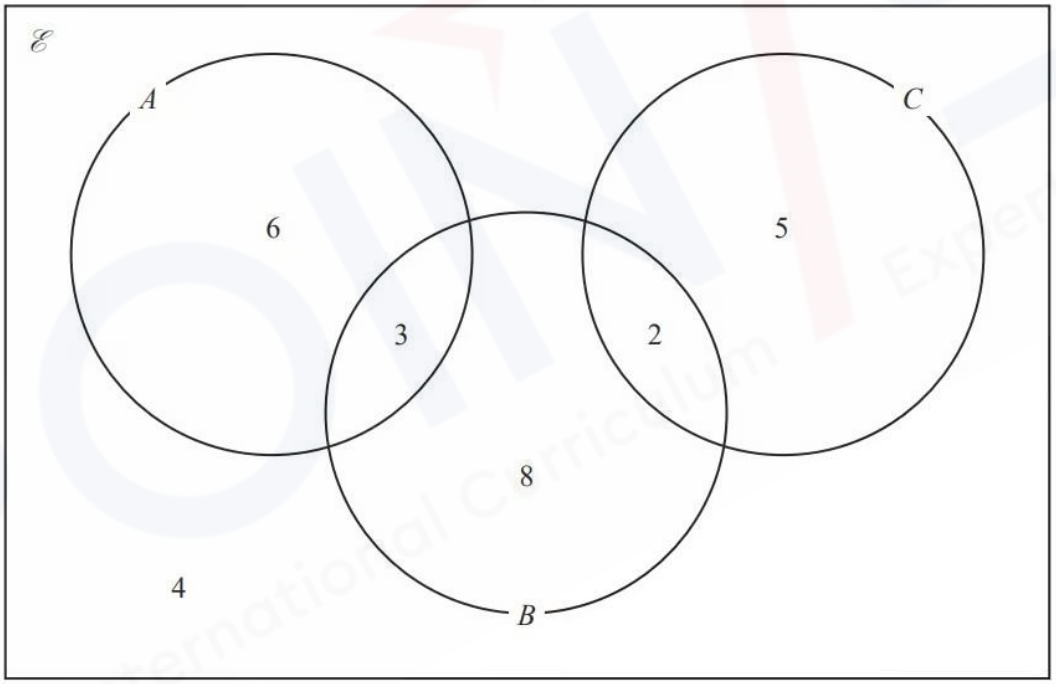
2	4	.....	.....	.....
1	.....	.....	.....	11
.....	−1	.....	.....	1

(3 marks)

12 Simplify $\frac{w^2}{w^3}$.

(1 mark)

13 (a) The Venn diagram shows a universal set $\mathcal{E}$ and three sets A, B and C.



6, 3, 8, 2, 5 and 4 represent the **numbers** of elements.

Find

$n(A \cup B)$

(1 mark)

(b) $n(A \cap B)$

(1 mark)

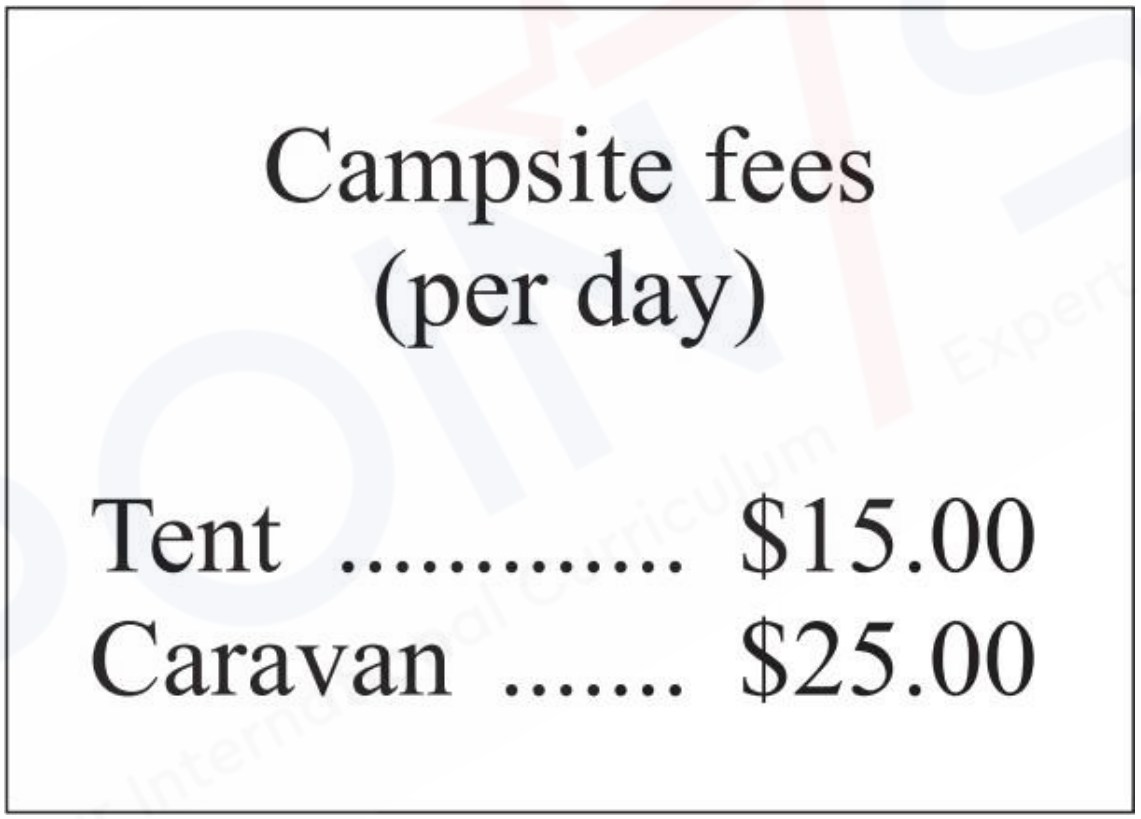
(c) $n(B \cap C')$

(1 mark)

(d) $n(A' \cup B' \cup C')$

(1 mark)

14



The sign shows the fees charged at a campsite.
Today there are 54 tents and 18 caravans on the site.

Calculate the fees charged today.

$ .....

(3 marks)

15 Work out $\frac{3}{4} + \frac{1}{6}$.

Give your answer in its simplest form.

(2 marks)

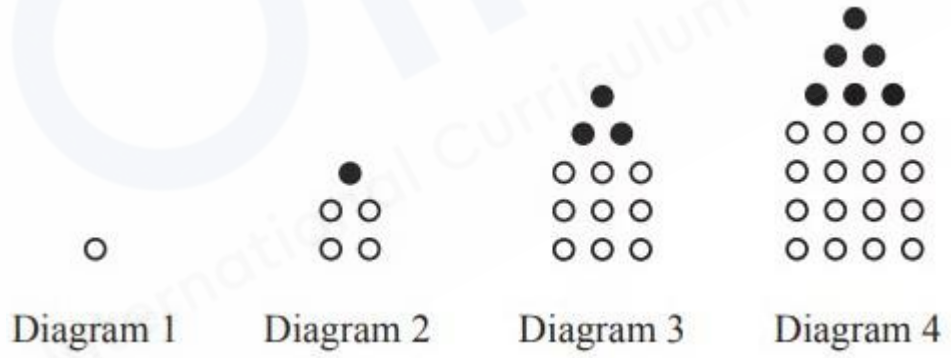
16 Calculate.

$$\frac{16.379 - 0.879}{4.2} \times 1.241$$

Give your answer correct to 2 significant figures.

(2 marks)

17



These are the first four diagrams of a sequence.
The diagrams are made from white dots and black dots.

T is the total number of dots used to make **all** of the first n diagrams.

$$T = an^3 + bn^2$$

Find the value of a and the value of b.
You must show all your working.

$a =$ .....

$b =$ .....

(5 marks)

18 Write each number in standard form.

i) 72 000

[1]

ii) 0.0018

[1]

(2 marks)

19 The number of passengers on a train increases from 63 to 77.

Calculate the percentage increase.

. .....%

(3 marks)

20 Solve the equation.

$$3(x-4)+\frac{x+2}{5}=6$$

x = ...

(4 marks)

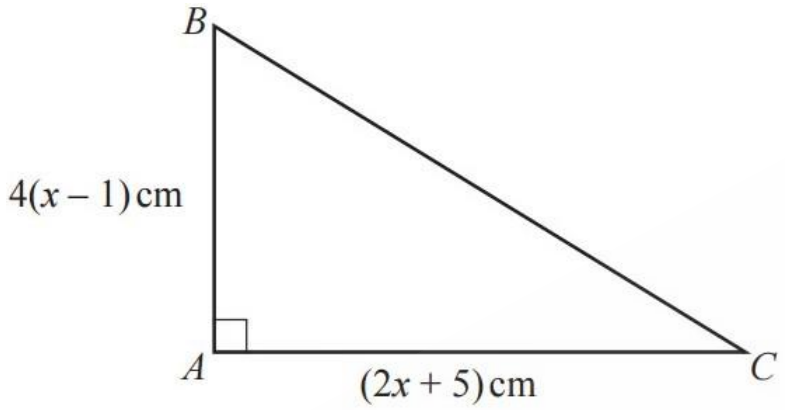
21 Marianne sells photos.
The selling price of each photo is \$6.
The selling price for each photo is made up of two parts, printing cost and profit.
For each photo, the ratio printing cost : profit = 5 : 3.

Calculate the profit she makes on each photo.

\$ .....

(2 marks)

22 (a) The diagram shows a right-angled triangle *ABC*.



NOT TO SCALE

The area of this triangle is 30 cm^2.
Show that $2x^2 + 3x - 20 = 0$.

(3 marks)

(b) Use factorisation to solve the equation $2x^2 + 3x - 20 = 0$.

x = ... or x = ...

(3 marks)

(c) Calculate *BC*.

BC =.....cm

(3 marks)

23 Write $x^2 + 10x + 14$ in the form $(x + a)^2 + b$.

(2 marks)

24 $w = 5y^2 - y^3$

Work out the value of w when $y = -2$

$w =$ .....

(2 marks)

25 32 33 34 35 36 37 38 39

From the list of numbers, write down

i) a multiple of 8,

[1]

ii) a square number,

[1]

iii)a prime number.

[1]

(3 marks)

26 (a) $\mathcal{E}$ = {students in a school}

F = {students who play football}

B = {students who play baseball}

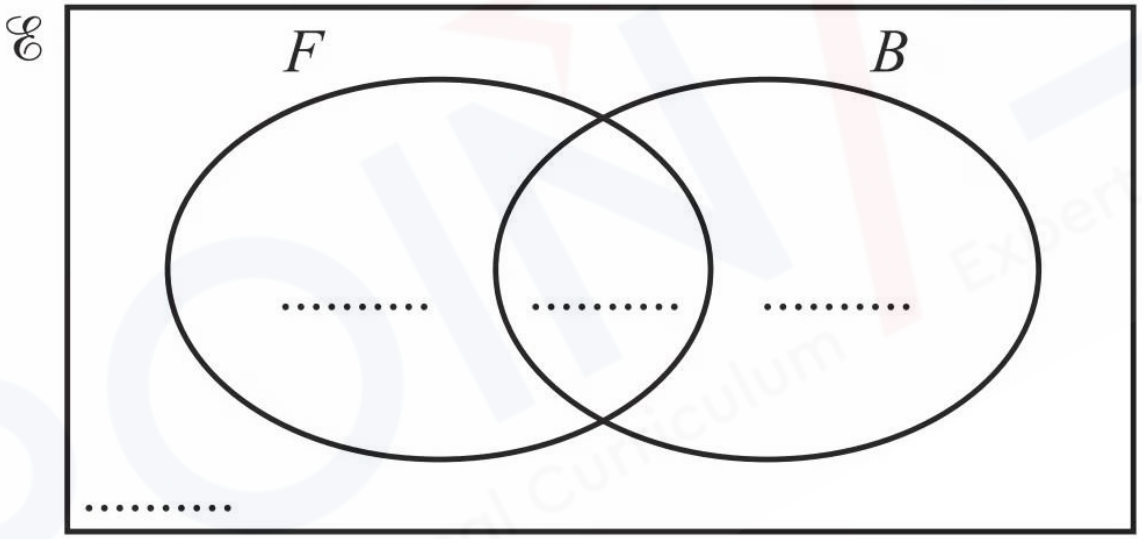
There are 240 students in the school.

• 120 students play football

• 40 students play baseball

• 90 students play football but not baseball.

Complete the Venn diagram to show this information.



(2 marks)

(b) Find $\mathrm{n}(F' \cap B')$.

(1 mark)

27 Calculate $\sqrt{2.38 + 6.4^2}$, writing down your full calculator display.

(1 mark)

28 $8300 = 100 \times 83$

Select the number that is closest in value to $\sqrt{8300}$

A. 19

B. 90

C. 830

D. 900

(1 mark)