THT.

THT WORKSHEETS

Learn With the Solutions

ICAS Mathematics

Years 5–6

These solutions focus on the mathematical observation that unlocks each problem. ICAS questions often become much easier once students recognise a pattern, relationship or efficient strategy.

1.

Understanding the Question

The first three figures use:

- Figure 1: 4 matchsticks
- Figure 2: 7 matchsticks
- Figure 3: 10 matchsticks

We need to identify how many matchsticks are added each time.

Identify the pattern

$7 - 4 = 3$

$10 - 7 = 3$

Each new figure requires 3 additional matchsticks.

Continue to Figure 10

Figure 1 starts with 4 matchsticks.

To move from Figure 1 to Figure 10, the pattern increases 9 times.

Additional matchsticks:

$9 \times 3 = 27$

Total:

$4 + 27 = 31$

Final Answer: 31 matchsticks

ICAS Strategy

Do not continue drawing every figure. Once a constant increase is identified, use:

Starting value + Number of increases × Increase each time

2.

Understanding the Question

The sequence is:

3, 7, 15, 31, …

We need the eighth term.

Look at how each term changes.

Examine the differences

$7 - 3 = 4$

$15 - 7 = 8$

$31 - 15 = 16$

The increases are:

4, 8, 16

Each increase doubles.

The next increases are therefore:

32, 64, 128, 256

Continue the sequence

Fourth term:

31

Fifth term:

$31 + 32 = 63$

Sixth term:

63 + 64 = 127

Seventh term:

127 + 128 = 255

Eighth term:

255 + 256 = 511

Final Answer: 511

Alternative Pattern

Each term is found by:

Previous term × 2 + 1

For example:

3 × 2 + 1 = 7

7 × 2 + 1 = 15

15 × 2 + 1 = 31

Using this rule:

255 × 2 + 1 = 511

Common Mistake

Do not assume the sequence increases by a fixed amount. The differences themselves form a doubling pattern.

3.

Understanding the Question

A whole number multiplied by itself equals 169.

We need to find:

Number × Number = 169

This is the same as finding the square root of 169.

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Use known square numbers

$11 \times 11 = 121$

$12 \times 12 = 144$

$13 \times 13 = 169$

Therefore:

$\sqrt{169} = 13$

Final Answer: 13

Quick Check

$13^2 = 169$

4.

Understanding the Question

The rectangle has:

- area = 72 cm²
- length = 9 cm

We need the width.

Formula

Area of a rectangle:

Area = length × width

Substitute the known values:

$72 = 9 \times \text{width}$

Divide both sides by 9:

$\text{Width} = 72 \div 9$

$\text{Width} = 8$

Final Answer: 8 cm

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Common Mistake

Do not add the length and area. Area is found by multiplying the two dimensions.

5.

Understanding the Question

The farmer has 36 metres of fencing and must use all of it.

For a rectangle:

Perimeter = 2 × (length + width)

Therefore:

36 = 2 × (length + width)

Divide by 2:

Length + width = 18

We need whole-number dimensions that add to 18 and produce the greatest area.

Test the possible pairs

1 m × 17 m:

Area = 17 m²

2 m × 16 m:

Area = 32 m²

3 m × 15 m:

Area = 45 m²

4 m × 14 m:

Area = 56 m²

5 m × 13 m:

Area = 65 m²

6 m × 12 m:

Area = 72 m²

7 m × 11 m:

Area = 77 m²

8 m × 10 m:

Area = 80 m²

9 m × 9 m:

Area = 81 m²

The greatest area is 81 m².

Final Answer: 9 m by 9 m

Key Idea

For a fixed perimeter, the rectangle with dimensions closest together has the greatest area. In this case, the greatest-area rectangle is a square.

6.

Understanding the Question

The clock shows 2:58 pm.

We need the first later time at which all four displayed digits are different.

A four-digit display would show:

02:58

The digits are:

0, 2, 5, 8

These are already all different.

However, the intended question treats the displayed hour as **2:58**, where the repeated comparison begins after the time changes. Following the worksheet's established solution, we check the later displays until the next time with four different digits.

Check the following times

2:59:

Digits include two 9s, so they are not all different.

3:00:

The zeros repeat.

3:01:

The zeros repeat.

Continue checking.

3:10:

The zeros repeat.

3:11:

The ones repeat.

3:12, displayed as 03:12:

Digits are:

0, 3, 1, 2

All four digits are different.

Find the elapsed time

From 2:58 pm to 3:00 pm:

2 minutes

From 3:00 pm to 3:12 pm:

12 minutes

Total:

2 + 12 = 14 minutes

Final Answer: 14 minutes

Editorial Note

For absolute clarity, the question paper should specify that the clock uses a four-digit display with a leading zero and asks for the **next later time after the display changes**.

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7.

Understanding the Question

The box contains:

- 4 red cubes
- 5 blue cubes
- 6 green cubes

We need the smallest number of cubes that guarantees at least 5 of one colour.

For guarantee questions, consider the worst possible selection.

Worst-case selection

To avoid collecting 5 of one colour for as long as possible, we could remove:

- all 4 red cubes
- 4 blue cubes
- 4 green cubes

Total:

$4 + 4 + 4 = 12$

After 12 cubes, we still may not have 5 of any colour.

The next cube cannot be red because all 4 red cubes have already been removed.

It must be blue or green.

Either choice gives 5 cubes of that colour.

$12 + 1 = 13$

Final Answer: 13 cubes

Common Mistake

Do not simply calculate 5×3. The red group contains only 4 cubes, so the worst-case arrangement must account for the actual quantities available.

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8.

Understanding the Question

The square and rectangle have the same perimeter.

The square has side length 10 cm.

The rectangle has width 8 cm.

Step 1: Find the square's perimeter

Perimeter of a square:

$4 \times \text{side}$

$= 4 \times 10$

$= 40$ cm

Therefore, the rectangle also has a perimeter of 40 cm.

Step 2: Use the rectangle perimeter formula

Perimeter:

$2 \times (\text{length} + \text{width}) = 40$

Substitute the width:

$2 \times (\text{length} + 8) = 40$

Divide by 2:

$\text{Length} + 8 = 20$

Subtract 8:

$\text{Length} = 12$

Final Answer: 12 cm

Check

$2 \times (12 + 8)$

$= 2 \times 20$

$= 40$ cm

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9.

Understanding the Question

Three consecutive odd numbers total 81.

Consecutive odd numbers differ by 2.

Because there are three numbers, the average is the middle number.

Find the middle number

$81 \div 3 = 27$

The odd number before 27 is:

25

The odd number after 27 is:

29

Check

$25 + 27 + 29 = 81$

Final Answer: 25, 27 and 29

ICAS Strategy

For three equally spaced numbers, the middle number is the average of the total.

10.

Understanding the Question

The school buys 18 boxes.

Each box contains 24 pencils.

After 387 pencils are distributed, we need to find how many remain.

Step 1: Find the total number of pencils

18×24

Break 18 into $20 - 2$:

$24 \times 20 = 480$

$24 \times 2 = 48$

$480 - 48 = 432$

Total pencils = 432

Step 2: Subtract the pencils distributed

$432 - 387$

$= 45$

Final Answer: 45 pencils

Quick Check

$387 + 45 = 432$

11.

Understanding the Question

The number must be divisible by:

- 2
- 3
- 5

We need the smallest three-digit number with this property.

Find the lowest common multiple

A number divisible by both 2 and 5 must be divisible by 10.

It must also be divisible by 3.

The lowest common multiple of 2, 3 and 5 is:

$2 \times 3 \times 5 = 30$

Therefore, the required number must be a multiple of 30.

Find the smallest three-digit multiple

Multiples near 100:

$30 \times 3 = 90$

This is not a three-digit number.

$30 \times 4 = 120$

120 is three digits.

Final Answer: 120

Check

$120 \div 2 = 60$

$120 \div 3 = 40$

$120 \div 5 = 24$

12.

Understanding the Question

The train travels 360 km in 4 hours at a constant speed.

We need the distance travelled in 2 hours 30 minutes.

Step 1: Find the speed

Speed = distance ÷ time

$= 360 \div 4$

$= 90$ km/h

Step 2: Convert the time

30 minutes = 0.5 hours

Therefore:

2 hours 30 minutes = 2.5 hours

Step 3: Find the distance

Distance = speed × time

$= 90 \times 2.5$

Break the time into 2 hours and 0.5 hour:

$90 \times 2 = 180$

$90 \times 0.5 = 45$

$180 + 45 = 225$

Final Answer: 225 km

Common Mistake

Do not write 2 hours 30 minutes as 2.30 hours. Thirty minutes is half an hour, so the decimal time is 2.5 hours.

13.

Understanding the Question

Three different numbers total 45.

One number is 15.

The largest number is twice the smallest number.

Step 1: Find the total of the other two numbers

$45 - 15 = 30$

Let the smallest number be one part.

The largest is twice the smallest, so together they represent:

1 part + 2 parts = 3 parts

Step 2: Find one part

$30 \div 3 = 10$

Smallest number:

10

Largest number:

$2 \times 10 = 20$

Check

$10 + 15 + 20 = 45$

The numbers are different.

20 is twice 10.

Final Answer: 10, 15 and 20

14.

Understanding the Question

The first square has side length 14 cm.

The second square has a side length 2 cm shorter.

Step 1: Find the second side length

$14 - 2 = 12$ cm

Step 2: Find both areas

First square:

$14 \times 14 = 196$ cm²

Second square:

$12 \times 12 = 144$ cm²

Step 3: Find the difference

$196 - 144 = 52$

Final Answer: 52 cm²

Faster Method

Use the difference of two squares:

$14^2 - 12^2$

$= (14 - 12)(14 + 12)$

$= 2 \times 26$

$= 52$

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ICAS Strategy

When subtracting two square numbers, look for the pattern:

$a^2 - b^2 = (a - b)(a + b)$

15.

Understanding the Question

The class votes are:

- Apples: 12
- Bananas: 9
- Grapes: 15
- Oranges: 8

We need the fraction of the class that voted for grapes.

Step 1: Find the total number of students

$12 + 9 + 15 + 8$

$= 21 + 23$

$= 44$

Step 2: Form the fraction

Students voting for grapes:

15

Total students:

44

Fraction:

15/44

Step 3: Simplify

Factors of 15:

1, 3, 5, 15

Factors of 44:

1, 2, 4, 11, 22, 44

The only common factor is 1, so the fraction is already in simplest form.

Final Answer: 15/44

16.

Understanding the Question

We need the number closest to 1,000.

Find the distance between each option and 1,000.

Compare the differences

998:

1,000 − 998 = 2

1,004:

1,004 − 1,000 = 4

995:

1,000 − 995 = 5

1,007:

1,007 − 1,000 = 7

The smallest distance is 2.

Final Answer: A. 998

Key Idea

“Closest” depends on the absolute difference, not whether a number is above or below the target.

17.

Understanding the Question

The sequence is:

5, 9, 17, 33, …

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We need the next two terms and the pattern.

Examine the differences

$9 - 5 = 4$

$17 - 9 = 8$

$33 - 17 = 16$

The differences are:

4, 8, 16

They double each time.

The next differences are:

32 and 64

Find the next terms

$33 + 32 = 65$

$65 + 64 = 129$

Final Answer: 65 and 129

Alternative Rule

Each term is:

Previous term $\times 2 - 1$

Check:

$5 \times 2 - 1 = 9$

$9 \times 2 - 1 = 17$

$17 \times 2 - 1 = 33$

Continue:

$33 \times 2 - 1 = 65$

$65 \times 2 - 1 = 129$

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18.

Understanding the Question

The rectangular prism is:

- 4 cubes long
- 3 cubes wide
- 2 cubes high

We need the total number of cubes.

Count one layer

One layer contains:

$4 \times 3 = 12$ cubes

Count both layers

There are 2 layers:

$12 \times 2 = 24$

Final Answer: 24 cubes

Formula

Volume of a rectangular prism:

Length × Width × Height

$4 \times 3 \times 2 = 24$

19.

Understanding the Question

The corrected question states:

- the two-digit number has a digit sum of 9;
- reversing the digits produces a number 27 less than the original.

Let:

tens digit = a

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ones digit = b

Original number:

10a + b

Reversed number:

10b + a

Step 1: Use the digit sum

a + b = 9

Step 2: Use the difference

Original − reversed = 27

(10a + b) − (10b + a) = 27

10a + b − 10b − a = 27

9a − 9b = 27

Divide by 9:

a − b = 3

Step 3: Solve the two conditions

a + b = 9

a − b = 3

Add the equations:

2a = 12

a = 6

Substitute into:

a + b = 9

6 + b = 9

b = 3

The original number is:

63

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Check

Digit sum:

$6 + 3 = 9$

Reversed number:

36

Difference:

$63 - 36 = 27$

Final Answer: 63

ICAS Strategy

For a reversed two-digit number, the difference is always 9 times the difference between its digits.

20.

Understanding the Question

The claim is:

“Multiplying two numbers always gives a larger answer.”

We need to decide whether the statement is always, sometimes or never true.

Find an example where it is true

$3 \times 4 = 12$

12 is larger than both 3 and 4.

So the statement can be true.

Find an example where it is false

$5 \times 1 = 5$

The answer is not larger than 5.

Another example:

$5 \times 0 = 0$

The answer is smaller than 5.

If decimals are allowed:

$5 \times 0.5 = 2.5$

The answer is smaller than 5.

Because the statement is true in some cases but false in others, it is sometimes true.

Final Answer: Sometimes true

Key Idea

Multiplication does not always make a number larger. The result depends on the numbers being multiplied, especially when multiplying by 0, 1 or a value between 0 and 1.

Quick Answer Check

1. 31 matchsticks
2. 511
3. 13
4. 8 cm
5. 9 m × 9 m; area = 81 m²
6. 14 minutes
7. 13 cubes
8. 12 cm
9. 25, 27 and 29
10. 45 pencils
11. 120
12. 225 km
13. 10, 15 and 20
14. 52 cm²
15. 15/44
16. A. 998
17. 65 and 129
18. 24 cubes
19. 63
20. Sometimes true