

## **THT WORKSHEETS**

### Learn With the Solutions

Cambridge IGCSE Mathematics

Extended

Mathematics

These solutions demonstrate the clear, structured working expected in Cambridge examinations. Students should write each important step, use accurate notation and include units where appropriate.

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1.

#### Understanding the Question

We need to solve:

$$5x - 12 = 3x + 8$$

The aim is to collect the x-terms on one side and the constants on the other.

#### Step 1: Remove 3x from the right-hand side

Subtract 3x from both sides:

$$5x - 3x - 12 = 3x - 3x + 8$$

$$2x - 12 = 8$$

#### Step 2: Remove -12

Add 12 to both sides:

$$2x - 12 + 12 = 8 + 12$$

$$2x = 20$$

#### Step 3: Isolate x

Divide both sides by 2:

# THT.

$$x = 10$$

## Check

Substitute  $x = 10$  into the original equation.

Left-hand side:

$$5(10) - 12 = 50 - 12 = 38$$

Right-hand side:

$$3(10) + 8 = 30 + 8 = 38$$

Both sides are equal.

**Final Answer:  $x = 10$**

## Common Mistake

Any operation performed on one side of an equation must also be performed on the other side.

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## 2.

### Understanding the Question

The rectangle has:

$$\text{Length} = 3x + 2 \text{ cm}$$

$$\text{Width} = x - 1 \text{ cm}$$

The perimeter is the total distance around the rectangle.

### Formula

Perimeter of a rectangle:

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

a) Form an expression for the perimeter

Substitute the expressions:

$$P = 2[(3x + 2) + (x - 1)]$$

Simplify inside the brackets:

$$3x + x = 4x$$

## THT.

$$2 - 1 = 1$$

Therefore:

$$P = 2(4x + 1)$$

Expand:

$$P = 8x + 2$$

**Final Answer:  $8x + 2$  cm**

b) Find the perimeter when  $x = 5$

Substitute  $x = 5$ :

$$P = 8(5) + 2$$

$$P = 40 + 2$$

$$P = 42$$

**Final Answer: 42 cm**

Check Using the Original Dimensions

Length:

$$3(5) + 2 = 17 \text{ cm}$$

Width:

$$5 - 1 = 4 \text{ cm}$$

Perimeter:

$$2(17 + 4) = 2(21) = 42 \text{ cm}$$

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3.

Understanding the Question

The ratio of boys to girls is:

$$5 : 7$$

There are 36 students altogether.

The ratio tells us that the class is divided into 12 equal parts.

# THT.

Step 1: Find the total number of ratio parts

$$5 + 7 = 12 \text{ parts}$$

Step 2: Find the value of one part

$$36 \div 12 = 3$$

Each ratio part represents 3 students.

a) Number of boys

$$5 \times 3 = 15$$

**Final Answer: 15 boys**

b) Number of girls

$$7 \times 3 = 21$$

**Final Answer: 21 girls**

Check

$$15 + 21 = 36$$

The ratio simplifies:

$$15 : 21 = 5 : 7$$

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4.

Understanding the Question

We need to simplify:

$$3(2a - 5) - 4(a + 1)$$

First expand both brackets, then collect like terms.

Step 1: Expand the first bracket

$$3(2a - 5)$$

$$= 3 \times 2a - 3 \times 5$$

$$= 6a - 15$$

## THT.

Step 2: Expand the second bracket

The expression contains:

$$-4(a + 1)$$

The negative 4 multiplies both terms:

$$-4(a + 1)$$

$$= -4a - 4$$

Step 3: Combine like terms

$$6a - 15 - 4a - 4$$

$$= 2a - 19$$

**Final Answer:  $2a - 19$**

### Common Mistake

When expanding  $-4(a + 1)$ , both terms inside the bracket become negative.

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## 5.

Understanding the Question

The original price is increased by 12%.

We need to calculate the increase and add it to the original price.

Original price = \$850

Step 1: Calculate 12% of \$850

$$12\% = 0.12$$

Increase:

$$850 \times 0.12 = 102$$

Step 2: Add the increase

New price:

$$850 + 102 = 952$$

**Final Answer: \$952**

## Faster Method

A 12% increase means the new price is 112% of the original.

$$850 \times 1.12 = 952$$

## Cambridge Tip

For a percentage increase, a multiplier of:

$1 + \text{percentage as a decimal}$

can be used.

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6.

## Understanding the Question

The ten marks are already arranged in ascending order:

58, 61, 64, 66, 68, 71, 74, 76, 82, 90

We need the mean and median.

### a) Mean

The mean is:

Total of values  $\div$  Number of values

Add the marks:

$$58 + 61 + 64 + 66 + 68 + 71 + 74 + 76 + 82 + 90$$

$$= 710$$

There are 10 students.

Mean:

$$710 \div 10 = 71$$

**Final Answer: Mean = 71**

### b) Median

Because there are 10 values, the median lies halfway between the fifth and sixth values.

Fifth value = 68

# THT.

Sixth value = 71

Median:

$$(68 + 71) \div 2$$

$$= 139 \div 2$$

$$= 69.5$$

**Final Answer: Median = 69.5**

## Common Mistake

For an even number of values, do not select only one middle value. Find the mean of the two middle values.

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7.

## Understanding the Question

We need to factorise:

$$x^2 - 9x + 20$$

Then use the factorised form to solve:

$$x^2 - 9x + 20 = 0$$

We need two numbers that:

- multiply to +20;
- add to -9.

The numbers are -4 and -5.

Factorise

$$x^2 - 9x + 20$$

$$= (x - 4)(x - 5)$$

Solve the equation

$$(x - 4)(x - 5) = 0$$

For a product to equal zero, at least one factor must equal zero.

## THT.

$$x - 4 = 0$$

$$x = 4$$

or:

$$x - 5 = 0$$

$$x = 5$$

**Final Answer:**

$$(x - 4)(x - 5)$$

$$x = 4 \text{ or } x = 5$$

Check

For  $x = 4$ :

$$4^2 - 9(4) + 20 = 16 - 36 + 20 = 0$$

For  $x = 5$ :

$$5^2 - 9(5) + 20 = 25 - 45 + 20 = 0$$

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8.

Understanding the Question

The car travels at a constant speed.

We first find the speed and then use it to calculate the distance travelled in 5.5 hours.

a) Average speed

Formula:

$$\text{Speed} = \text{Distance} \div \text{Time}$$

Speed:

$$240 \div 3 = 80$$

**Final Answer: 80 km/h**

b) Distance travelled in 5.5 hours

Formula:

# THT.

Distance = Speed  $\times$  Time

Distance:

$$80 \times 5.5$$

Break 5.5 into 5 and 0.5:

$$80 \times 5 = 400$$

$$80 \times 0.5 = 40$$

Total:

$$400 + 40 = 440$$

**Final Answer: 440 km**

## Common Mistake

Do not write 5 hours 30 minutes as 5.30 hours. It is equal to 5.5 hours.

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9.

## Understanding the Question

The three interior angles of a triangle total  $180^\circ$ .

The angles are:

$$2x^\circ$$

$$(3x + 10)^\circ$$

$$(4x - 20)^\circ$$

Step 1: Form an equation

$$2x + (3x + 10) + (4x - 20) = 180$$

Step 2: Collect like terms

$$2x + 3x + 4x = 9x$$

$$10 - 20 = -10$$

Therefore:

$$9x - 10 = 180$$

# THT.

Step 3: Solve

Add 10:

$$9x = 190$$

Divide by 9:

$$x = 190/9$$

This is the exact answer.

As a decimal:

$$x \approx 21.1$$

**Final Answer:  $x = 190/9 \approx 21.1$**

Check the Angles

Using  $x = 190/9$ :

$$2x = 380/9^\circ$$

$$3x + 10 = 660/9^\circ$$

$$4x - 20 = 580/9^\circ$$

Total:

$$(380 + 660 + 580)/9$$

$$= 1620/9$$

$$= 180^\circ$$

## Cambridge Tip

Because the instructions request exact answers unless stated otherwise, give **190/9** as the main answer. The decimal may be included as an approximation.

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## 10.

Understanding the Question

The investment earns 4.5% compound interest annually for three years.

Compound interest is calculated on the growing balance each year.

# THT.

Principal = \$9,000

Rate = 4.5% = 0.045

Number of years = 3

Formula

$$A = P(1 + r)^n$$

Substitute the values

$$A = 9,000(1 + 0.045)^3$$

$$A = 9,000(1.045)^3$$

Calculate the growth factor:

$$1.045^3 = 1.141166125$$

Therefore:

$$A = 9,000 \times 1.141166125$$

$$A = 10,270.495125$$

Round to the nearest cent:

**Final Answer: \$10,270.50**

Year-by-Year Check

After Year 1:

$$9,000 \times 1.045 = \$9,405.00$$

After Year 2:

$$9,405 \times 1.045 = \$9,828.225$$

After Year 3:

$$9,828.225 \times 1.045 = \$10,270.495125$$

Rounded:

\$10,270.50

**Correction Note**

The earlier uploaded solution listed \$10,270.52. The verified answer is **\$10,270.50**.

11.

## Understanding the Question

The line passes through:

(1, 3)

and:

(5, 11)

We need to find its gradient and equation.

### a) Gradient

Formula:

$$m = (\text{change in } y) / (\text{change in } x)$$

Substitute:

$$m = (11 - 3) / (5 - 1)$$

$$m = 8/4$$

$$m = 2$$

**Final Answer: Gradient = 2**

### b) Equation of the line

Use:

$$y = mx + c$$

Since  $m = 2$ :

$$y = 2x + c$$

Substitute the point (1, 3):

$$3 = 2(1) + c$$

$$3 = 2 + c$$

$$c = 1$$

Therefore:

## THT.

$$y = 2x + 1$$

**Final Answer:**  $y = 2x + 1$

Check Using the Second Point

When  $x = 5$ :

$$y = 2(5) + 1$$

$$= 11$$

The equation is correct.

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## 12.

Understanding the Question

The bag contains:

6 red counters

5 blue counters

4 yellow counters

Total counters:

$$6 + 5 + 4 = 15$$

Probability is:

Number of favourable outcomes  $\div$  Total number of possible outcomes

a) Probability of blue

There are 5 blue counters.

Probability:

$$5/15$$

Simplify by dividing numerator and denominator by 5:

$$5/15 = 1/3$$

**Final Answer:**  $1/3$

## THT.

b) Probability of not yellow

“Not yellow” means red or blue.

Number not yellow:

$$6 + 5 = 11$$

Probability:

$$11/15$$

The fraction cannot be simplified further.

**Final Answer: 11/15**

Alternative Method

Probability of yellow:

$$4/15$$

Therefore:

Probability of not yellow:

$$1 - 4/15 = 11/15$$

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## 13.

Understanding the Question

We need to expand:

$$(2x - 3)(x + 4)$$

Each term in the first bracket must multiply each term in the second bracket.

Expand

$$2x \times x = 2x^2$$

$$2x \times 4 = 8x$$

$$-3 \times x = -3x$$

$$-3 \times 4 = -12$$

Write all terms:

## THT.

$$2x^2 + 8x - 3x - 12$$

Combine like terms:

$$8x - 3x = 5x$$

Therefore:

$$\text{Final Answer: } 2x^2 + 5x - 12$$

### Common Mistake

Do not forget the product  $-3 \times 4$ . Every term must be multiplied.

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14.

### Understanding the Question

The circumference is 44 cm.

We are told to use:

$$\pi = 22/7$$

We need the radius.

### Formula

Circumference of a circle:

$$C = 2\pi r$$

### Substitute

$$44 = 2 \times 22/7 \times r$$

Simplify:

$$44 = 44r/7$$

Multiply both sides by 7:

$$308 = 44r$$

Divide by 44:

$$r = 7$$

$$\text{Final Answer: } 7 \text{ cm}$$

# THT.

Check

$$C = 2 \times 22/7 \times 7$$

$$C = 44 \text{ cm}$$

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15.

## Understanding the Question

The total hiring cost is modelled by:

$$C = 120 + 18d$$

where  $d$  is the number of days.

a) Interpret 120

The value 120 does not depend on  $d$ .

It is charged even if no hiring days are included.

Therefore, it represents the fixed hiring charge.

**Final Answer: \$120 is the fixed hiring charge.**

b) Cost for 12 days

Substitute  $d = 12$ :

$$C = 120 + 18(12)$$

Calculate:

$$18 \times 12 = 216$$

Then:

$$C = 120 + 216$$

$$C = 336$$

**Final Answer: \$336**

## Key Idea

In the model:

$$C = 120 + 18d$$

the coefficient 18 represents the cost per day.

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16.

## Understanding the Question

The rainfall values are:

January: 62 mm

February: 55 mm

March: 74 mm

April: 68 mm

May: 81 mm

a) Greatest rainfall

The largest value is 81 mm.

This occurred in May.

**Final Answer: May**

b) Range

Formula:

Range = Highest value – Lowest value

Highest rainfall = 81 mm

Lowest rainfall = 55 mm

Range:

$$81 - 55 = 26$$

**Final Answer: 26 mm**

## Common Mistake

The range is not the difference between the first and last months. It is the difference between the highest and lowest values.

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17.

## Understanding the Question

The original two-digit number:

- has digits that total 11;
- becomes 27 smaller when its digits are reversed.

Let:

$a$  = tens digit

$b$  = ones digit

The original number is:

$$10a + b$$

The reversed number is:

$$10b + a$$

Step 1: Use the digit sum

$$a + b = 11$$

Step 2: Use the difference

The reversed number is 27 less than the original:

$$(10a + b) - (10b + a) = 27$$

Expand:

$$10a + b - 10b - a = 27$$

$$9a - 9b = 27$$

Divide by 9:

$$a - b = 3$$

Step 3: Solve the simultaneous equations

$$a + b = 11$$

$$a - b = 3$$

Add the equations:

## THT.

$$2a = 14$$

$$a = 7$$

Substitute into:

$$a + b = 11$$

$$7 + b = 11$$

$$b = 4$$

Therefore, the original number is:

$$74$$

Check

Digit sum:

$$7 + 4 = 11$$

Reversed number:

$$47$$

Difference:

$$74 - 47 = 27$$

**Final Answer: 74**

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## 18.

### Understanding the Question

The student claims:

“If a quadrilateral has four equal sides, it must be a square.”

We need to decide whether this statement is always true.

A square has:

- four equal sides;
- four right angles.

However, another quadrilateral can have four equal sides without having four right angles.

# THT.

A rhombus has four equal sides, but its angles do not necessarily equal  $90^\circ$ .

Therefore, a rhombus provides a counterexample.

**Final Answer: The statement is not always true.**

A quadrilateral with four equal sides could be a rhombus rather than a square.

## Key Idea

To disprove an “always” statement, one valid counterexample is sufficient.

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## Quick Answer Check

1.  $x = 10$
2. a)  $8x + 2$  cm  
b) 42 cm
3. a) 15 boys  
b) 21 girls
4.  $2a - 19$
5. \$952
6. Mean = 71  
Median = 69.5
7.  $(x - 4)(x - 5)$   
 $x = 4$  or  $5$
8. a) 80 km/h  
b) 440 km
9.  $x = 190/9 \approx 21.1$
10. \$10,270.50
11. a) Gradient = 2  
b)  $y = 2x + 1$
12. a)  $1/3$   
b)  $11/15$
13.  $2x^2 + 5x - 12$
14. 7 cm
15. a) Fixed hiring charge  
b) \$336
16. a) May  
b) 26 mm

**THT.**

17.74

18. Not always true; a rhombus is a counterexample.