



1 Solve $x^2 - 11x + 28 = 0$

(3 marks)

Find two numbers that multiply to 28 and add to -11: they are -4 and -7

Factorise

$$(x - 4)(x - 7) = 0$$

$$\text{So } x = 4 \text{ or } x = 7$$

$$x = 4 \text{ or } x = 7$$

2 Solve $7x - 4 > 3x + 12$

(3 marks)

$$\begin{array}{lcl} & = & 7x - 4 > 3x + 12 \\ -3x & = & 4x - 4 > 12 \quad -3x \\ +4 & = & 4x > 16 \quad +4 \\ \div 4 & = & x > 4 \quad \div 4 \end{array}$$

$$x > 4$$

3 Use trial and improvement to find the cube root of 300, correct to 1 decimal place. Do not use the cube root key on your calculator. You must show all your trials.

(3 marks)

$$6.6^3 = 287.496 \text{ too small}$$

$$6.7^3 = 300.763 \text{ too big}$$

try the middle, 6.65

$$6.65^3 = 294.08 \text{ too small}$$

between 6.65 and 6.7

$$6.7$$

4 There are 60 students in Year 10 and Year 11 at a small school.

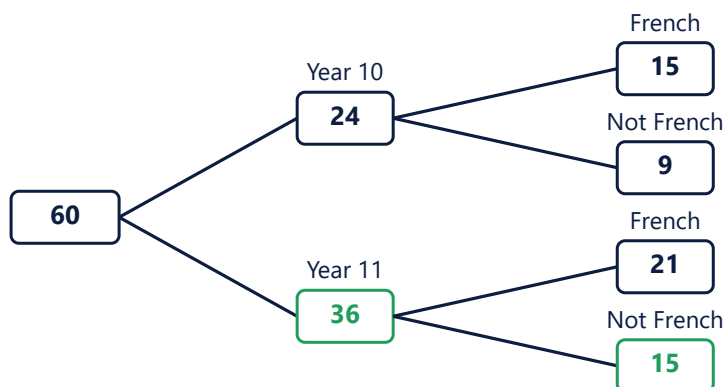
24 of the students are in Year 10 and the rest are in Year 11.

Of the Year 10 students, 15 study French and 9 do not.

Of the Year 11 students, 21 study French.

a. Work out the number of students in Year 11.

b. Work out the number of Year 11 students who do not study French.



(3 marks)

A frequency tree counts people, rather than showing probabilities. The two branches leaving each group must add to the number in that group

$$\text{Number in Year 11} = 60 - 24 = 36$$

$$\text{Year 11 students not studying French} = 36 - 21 = 15$$

Check

$$15 + 9 = 24 \text{ and } 21 + 15 = 36, \text{ so every branch adds up correctly}$$

5 Solve $\frac{x}{3} + 2 = 6$

(2 marks)

$$\begin{array}{rcl} \frac{x}{3} + 2 & = & 6 \\ -2 & & \\ \hline \frac{x}{3} & = & 4 \\ \times 3 & & \\ \hline x & = & 12 \end{array}$$

$x = 12$

6

Work out $\frac{5}{8} \div \frac{3}{4}$

Give your answer in its simplest form.

(2 marks)

$$= \frac{5}{8} \div \frac{3}{4}$$

Keep, flip, multiply

$$= \frac{5}{8} \times \frac{4}{3}$$

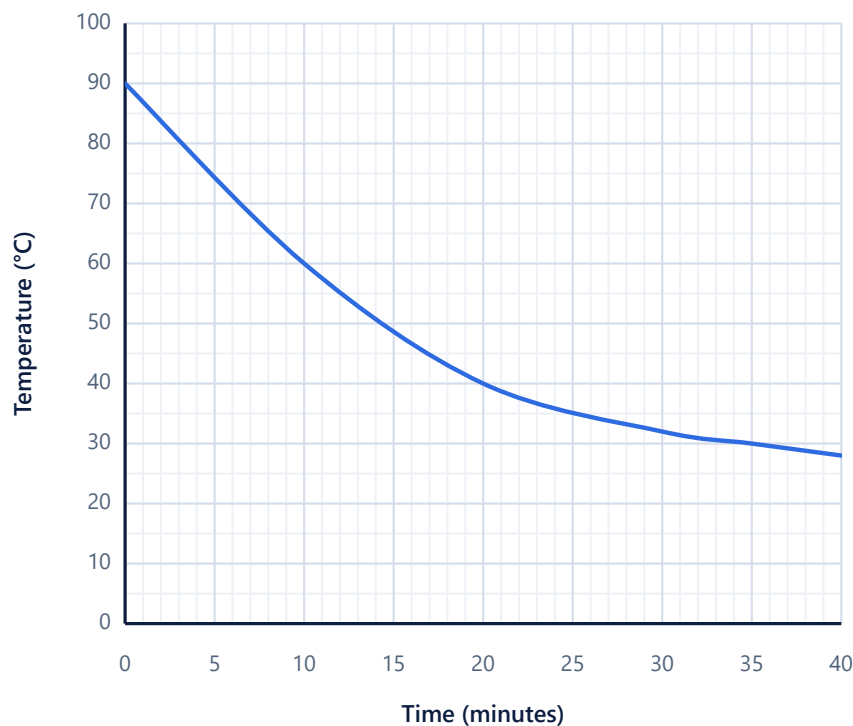
$$= \frac{20}{24}$$

$$\boxed{\frac{5}{6}}$$

7

The graph shows the temperature of a cup of coffee as it cools.

- Write down the temperature of the coffee at the start.
- Find the temperature of the coffee after 20 minutes.
- Find how long the coffee takes to cool to 30°C.



(3 marks)

- Read the curve at time 0: the temperature is 90°C
- Read up from 20 minutes to the curve and across: 40°C
- Read across from 30°C to the curve and down: 35 minutes

8

In a sale, all prices are reduced by 15%.

The sale price of a jumper is £68.

Work out the normal price of the jumper.

(2 marks)

The sale price is $100\% - 15\% = 85\%$ of the normal price

The original price was multiplied by 0.85 to obtain the sale price. Undo that multiplication by dividing by 0.85; adding 15% of the sale price would use the wrong starting amount

$$\text{Normal price} = 68 \div 0.85 = £80$$

Check

$$80 \times 0.85 = £68$$

£80

9

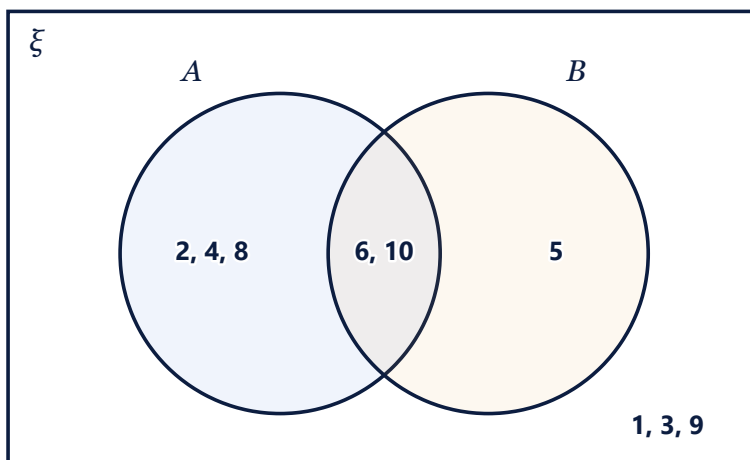
$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{even numbers}\}$ $B = \{\text{multiples of 5}\}$

Kim draws a Venn diagram. She puts:

2, 4, 8 in A only 6, 10 in the intersection of A and B 5 in B only 1, 3, 9 outside both circles.

Write down **two** mistakes Kim has made.



(2 marks)

6 is even but not a multiple of 5, so it belongs in A only, not in A intersection B

Every number in the universal set must appear exactly once: 7 is odd and not a multiple of 5, so it should be outside both circles, but Kim has left it out

- 10 A cylindrical tin has a diameter of 8 cm and a height of 10 cm.
Work out the volume of the tin.
Give your answer correct to 3 significant figures.

(3 marks)

$$\text{The radius} = 8 \div 2 = 4 \text{ cm}$$

$$\text{Volume} = \pi r^2 h = \pi \times 4^2 \times 10 = 160\pi$$

$$\text{Volume} = 502.654... = 503 \text{ cm}^3 \text{ (3 significant figures)}$$

$$\boxed{503 \text{ cm}^3}$$

- 11 Ben buys a car for £16 000.
The value of the car depreciates by 15% each year.
Work out the value of the car at the end of 2 years.

(2 marks)

End of year 1

$$16\,000 \times 0.85 = £13\,600$$

End of year 2

$$13\,600 \times 0.85 = £11\,560$$

Check

$$16\,000 \times 0.85^2 = £11\,560$$

$$\boxed{£11\,560}$$

12

In triangle PQR, angle PQR = 90° and angle PRQ = 52° .

PQ = 9 cm.

Work out the length of PR.

Give your answer correct to 3 significant figures.

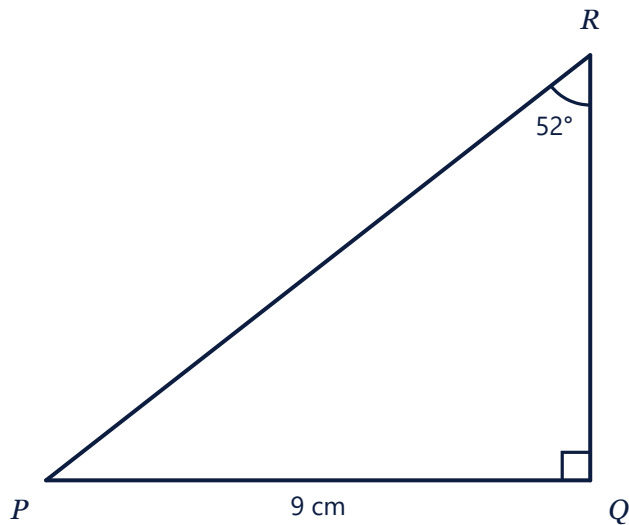


Diagram NOT accurately drawn

(2 marks)

PQ = 9 cm is opposite the 52° angle and PR is the hypotenuse, so use sin

$$\sin 52^\circ = 9 \div PR$$

$$PR = 9 \div \sin 52^\circ = 9 \div 0.7880... = 11.42... = 11.4 \text{ cm (3 sf)}$$

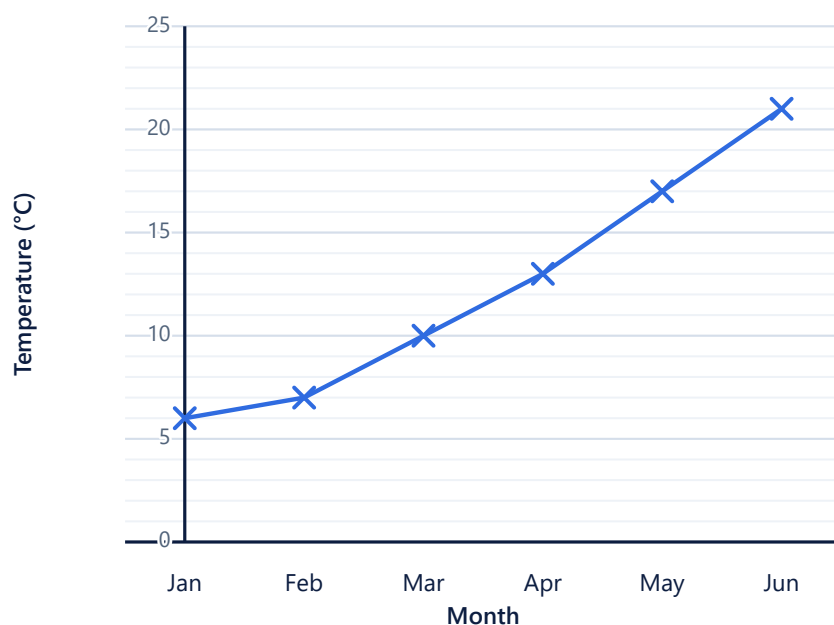
11.4 cm

13

A line graph shows the midday temperature in a town on the first day of each month. The table gives the plotted values.

Month	Temperature ($^{\circ}\text{C}$)
January	6
February	7
March	10
April	13
May	17
June	21

- Write down the month in which the temperature was 13°C .
- Work out the difference between the temperature in June and the temperature in January.



(2 marks)

- a) The value 13°C is plotted for April
- b) $21 - 6 = 15^{\circ}\text{C}$

14

In triangle ABC, angle A = 35° and angle B = 80° .

In triangle DEF, angle D = 80° and angle E = 65° .

Show that triangle ABC is similar to triangle DEF.

(2 marks)

Angles in a triangle sum to 180° , so angle C = $180 - 35 - 80 = 65^{\circ}$

Also angle F = $180 - 80 - 65 = 35^{\circ}$

Both triangles have angles of 35° , 80° and 65° . Two triangles with the same three angles are similar

15

A bag contains only red, blue and yellow counters.

The numbers of red, blue and yellow counters are in the ratio 2 : 3 : x.

A counter is taken at random from the bag.

The probability that it is yellow is $\frac{2}{7}$.

Work out the value of x.

(3 marks)

$$\text{Fraction of counters that are yellow} = \frac{x}{2 + 3 + x} = \frac{x}{5 + x}$$

$$\text{So } \frac{x}{5 + x} = \frac{2}{7}$$

$$7x = 2(5 + x), \text{ so } 7x = 10 + 2x, \text{ giving } 5x = 10 \text{ and } x = 2$$

Check: ratio 2 : 3 : 2 has total 7 parts and yellow is $\frac{2}{7}$

2

16

a. Expand and simplify $(y + 7)(y - 7)$

b. Factorise $x^2 + x - 30$

(4 marks)

$$\text{a) } (y + 7)(y - 7) = y^2 - 7y + 7y - 49 = y^2 - 49$$

b) Find two numbers that multiply to -30 and add to 1: they are 6 and -5

$$\text{b) } x^2 + x - 30 = (x + 6)(x - 5)$$

17

5 identical pipes can fill a storage tank in 4.8 hours.

Only 3 of the pipes are working.

Work out how long the 3 pipes will take to fill the tank.

(3 marks)

$$\text{Total work} = 5 \times 4.8 = 24 \text{ pipe-hours}$$

$$\text{Time for 3 pipes} = 24 \div 3 = 8 \text{ hours}$$

Check

$$3 \times 8 = 24, \text{ the same total work}$$

8 hours

- 18 The pressure on a floor is 45 N/m^2 . The area in contact with the floor is 0.8 m^2 .
Work out the force.

(2 marks)

$$p = F \div A \text{ so } F = p \times A$$

$$F = 45 \times 0.8$$

$$36 \text{ N}$$

- 19 Ali throws a fair coin 3 times.

Each throw lands on heads (H) or tails (T).

List all the possible outcomes of the 3 throws. One outcome, HHH, has been done for you.

(2 marks)

Work systematically, starting with outcomes beginning H
HHH, HHT, HTH, HTT, then THH, THT, TTH, TTT

There are 8 outcomes in total

HHH, HHT, HTH, HTT, THH, THT, TTH, TTT

- 20 Triangle DEF is a right-angled triangle with the right angle at E.

The hypotenuse $DF = 20 \text{ cm}$ and $DE = 8 \text{ cm}$.

Work out the length of EF.

Give your answer correct to 1 decimal place.

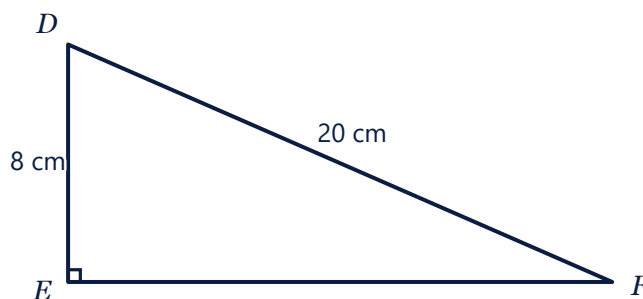


Diagram NOT accurately drawn

(2 marks)

EF is a shorter side, so rearrange Pythagoras' theorem

$$EF^2 = DF^2 - DE^2$$

$$EF^2 = 20^2 - 8^2 = 400 - 64 = 336$$

$$EF = \sqrt{336} = 18.330... = 18.3 \text{ cm (1 decimal place)}$$

$$18.3 \text{ cm}$$