# Number

## List all of the integers that satisfy the inequalities:

$2 < a < 7 \rightarrow 3, 4, 5, 6$
$-3 \le b < 2 \rightarrow -3, -2, -1, 0, 1$
$-5 < c \le 0 \rightarrow -4, -3, -2, -1, 0$
$16 \le d \le 22 \rightarrow 16, 17, 18, 19, 20, 21, 22$

## Complete the table of equivalent fractions, decimals and percentages. Write fractions in their simplest form.

| Fraction | Decimal | Percentage |
|---|---|---|
| $\frac{1}{10}$ | 0.1 | 10% |
| $\frac{1}{100}$ | 0.01 | 1% |
| $\frac{30}{100} = \frac{3}{10}$ | 0.3 | 30% |
| $\frac{35}{100} = \frac{7}{20}$ | 0.35 | 35% |
| $\frac{31}{100}$ | 0.31 | 31% |
| $\frac{22}{100} = \frac{11}{50}$ | 0.22 | 22% |
| $\frac{68}{100} = \frac{17}{25}$ | 0.68 | 68% |
| $\frac{81}{100}$ | 0.81 | 81% |
| $\frac{42}{100} = \frac{21}{50}$ | 0.42 | 42% |
| $\frac{9}{25} = \frac{36}{100}$ | 0.36 | 36% |

## Cross out the answers to the questions in the grid below.

a. The factors of 16 → 1, 2, 4, 8, 16
b. The factors of 7 → 1, 7
c. The first 3 multiples of 8 → 8, 16, 24
d. The first 4 multiples of 9 → 9, 18, 27, 36
e. The HCF of 18 and 24 → 6
f. The LCM of 6 and 10 → 30

You should have 3 numbers left.
Find the HCF of them. 60, 100, 120
HCF = **20**

| 1 | 18 | 120 |
|---|---|---|
| 36 | 6 | 30 |
| 60 | 7 | 8 |
| 16 | 9 | 27 |
| 100 | 24 | 4 |

Write the following as products of prime factors:

$18$: $\overset{2}{\underset{}{9}}\ \overset{3}{\underset{3}{}}$  $18 = 2 \times 3^2$

$20$: $\overset{2}{\underset{10}{}}\ \overset{2}{5}$  $20 = 2^2 \times 5$

$45$: $\overset{3}{9}\ \overset{3}{}\ 5$  $45 = 3^2 \times 5$

## Calculate:

a. $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$

b. $\frac{2}{9} + \frac{4}{9} = \frac{6}{9} = \frac{2}{3}$

c. $\frac{5}{12} - \frac{3}{12} = \frac{2}{12} = \frac{1}{6}$

d. $\frac{3}{12} + \frac{4}{12} = \frac{7}{12}$

e. $\frac{6}{7} - \frac{4}{7} = \frac{2}{7}$

f. $\frac{2}{7} + \frac{3}{5} = \frac{10}{35} + \frac{21}{35} = \frac{31}{35}$

g. $\frac{8}{11} - \frac{1}{3} = \frac{24}{33} - \frac{8}{33} = \frac{16}{33}$

h. $\frac{7}{10} + \frac{3}{8} = \frac{28}{40} + \frac{15}{40} = \frac{43}{40}$

## Calculate:

a. $\frac{3}{7} \times \frac{2}{6} = \frac{6}{42} = \frac{1}{7}$

b. $\frac{2}{11} \times \frac{5}{8} = \frac{10}{88} = \frac{5}{44}$

c. $\frac{4}{14} \times \frac{2}{2} = \frac{8}{28} = \frac{2}{7}$

d. $\frac{4}{9} \times \frac{13}{13} = \frac{117}{117}$

e. $\frac{4}{8} \div \frac{5}{7} = \frac{36}{56} = \frac{9}{14}$

f. $\frac{2}{15} \times 6\frac{3}{7} = \frac{14}{45} = \frac{7}{45}$

g. $\frac{5}{12} \times \frac{7}{5} = \frac{25}{24} = 1\frac{1}{24}$

h. $\frac{2}{15} \div \frac{4}{11} = \frac{77}{60} = 1\frac{17}{60}$

Increase 200 by 12% 224
Decrease 4500 by 41% 2655
Increase 900 by 33% 1197

James invests £500 at a rate of 10% compound interest per year.
How much does James have after 2 years? £605

The value of a car depreciates by 20% each year. It was worth £8000 when it was bought 2 years ago.
How much is it worth now? £5120

1. Divide 150 in the ratio 7:8.  $7 + 8 = 15$  $8 \times 10 = 80$
$150 \div 15 = 10$  $7 \times 10 = 70$  **70:80**

2. Divide 72 in the ratio 2:1.  $2 + 1 = 3$
$72 \div 3 = 24$  **48:24**

3. Divide 143 in the ratio 4:6:3.  $4 + 6 + 3 = 13$
$143 \div 13 = 11$  **44:66:33**

Write 125000 in standard form $1.25 \times 10^5$
Write 0.00025 in standard form $2.5 \times 10^{-4}$
Calculate $(4 \times 10^4) \times (5 \times 10^6)$ $2 \times 10^{11}$ writing your answer in standard form.
Calculate $(8 \times 10^4) \div (4 \times 10^9)$ $2 \times 10^{-5}$ writing your answer in standard form.

# Number Exam Questions

_Answers_

A gym has 275 members.

40% are bronze members.
28% are silver members.
The rest are gold members.

Work out the number of gold members.

$$100 - 40 - 28 = 32$$

Need 32% of 275

$$10\% = 27.5 \qquad 30\% = 82.5$$
$$20\% = 55 \qquad 32\% = 82.5 + 5.5$$
$$1\% = 2.75$$
$$2\% = 5.5 \qquad 32\% = 88$$

Need 32% of 275 = **88**

---

Here are two offers for batteries.

**OFFER A**
Pack of 4
£2.52
$\frac{1}{3}$ off

$(4 \times 10 = 40)$

**OFFER B**
Pack of 5
£2.75
Pay for 3 packs get 1 free

$(5 \times 8 = 40)$

Pay for 6 packs and get 2 free

Zak wants to buy 40 batteries.
Which is the cheaper offer?
You **must** show your working.

Offer A
$£2.52 \times 10 = £25.20$
$$\begin{array}{r} 25.20 \\ -\ 8.40 \\ \hline £16.80 \end{array}$$
$£25.20$
$3)\overline{25.20}$
$£8.40$

Offer B
$£2.75 \times 6$
$6 \times £2 = £12$
$6 \times 20.75 = £4.50$
$£12 + £4.50 = £16.50$

**Offer B Cheaper**

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Kamil looks at two cars.

The normal price of Car A is £1550
The normal price of Car B is £1950

The cars are part of this offer.

① Cars up to £1800
Sale price
20% off the normal price

② Cars over £1800
Sale price
$\frac{1}{3}$ off the normal price

③ Special Offer
When the sale price is over £1250
Get an extra 5% off the sale price

After all reductions, which car is cheaper, Car A or Car B?
You **must** show your working.

**CAR A**
① Need to take 20% off £1800
$$10\% = £180$$
$$20\% = £360$$
$$\begin{array}{r} £1800 \\ -\ 360 \\ \hline £1440 \end{array}$$

③ Sale price is over £1250 so
Need to take off 5%
$$10\% = 144$$
$$5\% = 72$$
$$\begin{array}{r} 1440 \\ -\ 72 \\ \hline £1368 \end{array}$$

**CAR B**
② Need to find $\frac{1}{3}$ of £1950
$$\begin{array}{r} 650 \\ 3)\overline{1950} \end{array}$$
$$\begin{array}{r} 1950 \\ -\ 650 \\ \hline £1300 \end{array}$$

③ Sale price over £1250 so
Need to take 5% off
$$10\% = 130$$
$$5\% = 65$$
$$\begin{array}{r} 1300 \\ -\ 65 \\ \hline £1235 \end{array}$$

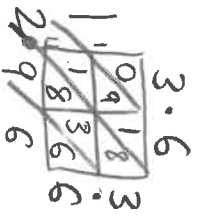**CAR B is cheaper**

Answers.

# Standard Form and Reverse %

(a) Write 0.000583 in standard form.

Answer    $5.83 \times 10^{-4}$    (1)

(b) Write $9.416 \times 10^5$ as an ordinary number.

Answer    $941600$    (1)

(c) Divide 7200 million by 300
Give your answer in standard form.

$7200000000$

$300 \overline{)24000000000}$

$3 \overline{)72000000}$

Answer    $2.4 \times 10^7$    (3)

$R = \dfrac{x^2}{y}$

$x = 3.6 \times 10^5$

$y = 7.5 \times 10^4$

Work out the value of R.

$x^2 = (3.6 \times 10^5) \times (3.6 \times 10^5)$

$= (12.96 \times 10^{10})$
$= (1.296 \times 10^{11}) \times 10$

$\div 10 ( 1.296 \times 10^{11} ) \times 10$

|   | 3 | . | 6 |
|---|---|---|---|
| 1 | 3 | 0 | 6 |
| . | 8 | 1 | 8 |
| 6 | 6 | 3 | 9 |

2·9 6

Give your answer in standard form to an appropriate degree of accuracy.

$\dfrac{1.296 \times 10^{11}}{7.5 \times 10^4} = 1.728 \times 10^6$

Maybe need a
calc for this!

Answer

In a sale, a TV is reduced in price by 20%.
The sale price is £280.
After the sale, the price goes back to the original price.
Matt has £340 to spend.

Can he afford the TV when it goes back to its original price?

$\div 8 ( £280 = 80\% ) \div 8$
$( £35 = 10\% )$
$\times 10 ( £350 = 100\% ) \times 10$

$280 = 80\%$

$\begin{array}{r} 035.00 \\ 8 \overline{)280.00} \end{array}$

So no, he doesn't have
enough money

# Algebra

## Factorise the expressions:

1. $2x + 6 = 2(x+3)$
2. $6(a-5) = 3(t+5)$  ... $3x + 15 = 3(t+5)$
3. $7p - 28 = 7(p-4)$
4. $8a + 2 = 2(4a+1)$

## Simplify by expanding the brackets:

1. $3(x+1) \rightarrow 3x+3$
2. $6(a-5) \rightarrow 6a-30$
3. $9(h+4) \rightarrow 9h+36$
4. $2(3c+7) \rightarrow 6c+14$
5. $9(5k+3) \rightarrow 45k+27$
6. $11(6+4i) \rightarrow 66+44i$
7. $4d(d+5) \rightarrow 4d^2+20d$
8. $7g(2g+8) \rightarrow 14g^2+56g$
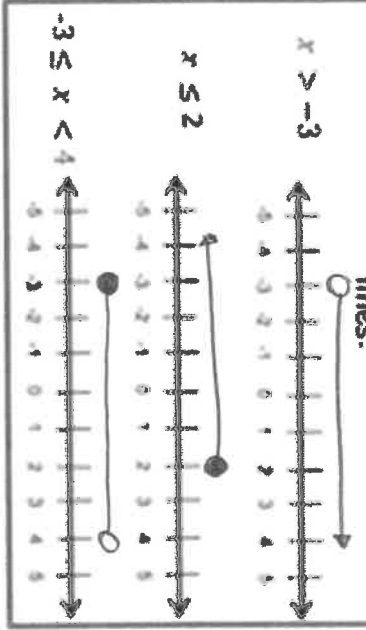9. $3(p+8)+4p \rightarrow 7p+24$
10. $3(j+5)+2j \rightarrow \underline{5j+11}$

## Use FOIL to simplify the expressions:

1. $(x+4)(x+6) \rightarrow x^2+10x+24$
2. $(p+3)(p+4) \rightarrow p^2+7p+12$
3. $(t+5)^2 \rightarrow t^2+10t+25$

## Solve the equation:

$3a + 2 = 17 \quad a=5$

$4b - 5 = 35 \quad b=8$

$2c + 8 = 20 \quad c=6$

$11d - 12 = 43 \quad d=5$

$6e + 15 = 87 \quad e=12$

$4f + 17 = -7 \quad f=-6$

$\dfrac{2g}{5} = 6 \quad g=15$

## Solve the equations:

$5a + 7 = 19 - 3a \quad x=1.5$

$8b + 5 = 2b + 29 \quad b=4$

$7 + 3c = 17 + c \quad c=5$

$6d - 12 = 2d + 20 \quad d=8$

$4e - 18 = e + 5 \quad e=\frac{13}{3}$

$7f - 15 = 4f - 8$

$3f = 7 \quad f = \dfrac{7}{3}$

## Represent the inequalities on the number lines:

$x > -3$

$x \leq 2$

$-3 \leq x < 4$

## Simplify:

$a^5 \times a^6 \rightarrow a^{11}$

$2c^2 \times c^9 = 2c^{11}$

$f^8 \div f^2 = f^6$

$6h^8 \div 3h^5 = 2h^3$

$\dfrac{4j \times 3j^5}{2j^3} = 6j^4$

$b^4 \times b^7 = b^{11}$

$24d^9 \div 3d^4 \times 8d^5$

$g^{19} \div g^{61} \times g^{42}$

$7i.6 \div 42i^9 \div 6i^3$

$\dfrac{6k \times 7k^9}{3k^5} = 14k^5$

## Make x the subject of the formulae:

a. $y = x + 2 \quad x = y-2$

b. $y = 3x \quad x = \dfrac{y}{3}$

c. $y = \dfrac{x}{4} \quad x = 4y$

d. $y = 2x + 4 \quad x = \dfrac{y+7}{3}$

e. $y = 3x - 7 \quad x = \dfrac{y+7}{3}$

f. $y = 9x + 17 \quad x = \dfrac{y-17}{9}$

g. $y = 2x + 3z \quad x = \dfrac{y-3z}{2}$

## Find the nth term of each sequence:

a. $4, 8, 12, 16, 20 \rightarrow 4n$

b. $4, 7, 10, 13, 16 \rightarrow 3n+1$

c. $6, 13, 20, 27, 34 \rightarrow 7n-1$

d. $3, 14, 25, 36, 47 \rightarrow 11n-8$

e. $9, 17, 25, 33, 41 \rightarrow 8n+1$

f. $6, 11, 16, 21, 26 \rightarrow 5n+1$

g. $8, 6, 4, 2, 0 \rightarrow -2n+10$

## Solve the following Simultaneous equations:

1) $2x + 3y = 13$
   $4x + 4y = 20$ $\quad x=2, y=3$

2) $3x + 2y = 23$
   $5x - y = 8$ $\quad x=3, y=7$

# Algebra exam questions

(a) Solve    $6x = 54$    $(\div 6)$

$\underline{x = 9}$

$x = $ ..............

(b) Solve    $3y + 15 = 9$

$y \rightarrow \boxed{\times 3} \rightarrow \boxed{+15} \rightarrow 9$

$-\dfrac{y}{-2} \leftarrow \boxed{\div 3} \leftarrow \boxed{-15} \leftarrow 9$
$-6$

$y = y = -2$

(c) Solve    $4y + 2 = 2y + 7$

$\overset{(w)}{\phantom{x}} \qquad \overset{(y)}{\phantom{x}}$

$2w + 2 = 7$    $(-2w)$

$2w = 5$    $(-2)$

$\underline{w = 2.5}$

(a) Solve    $\dfrac{x}{5} = -6$    $(\times 5)$

$\underline{x = -30}$

Answer $x = $ ..............

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Here is a linear sequence.

Work out the $n$th term of the sequence.

$46 \quad 40 \quad 34 \quad 28 \quad 22$
$\phantom{4}\searrow_{-6}\phantom{0}\searrow_{-6}\phantom{0}\searrow_{-6}\phantom{0}\searrow_{-6}$

$\underline{-6n + 52}$

(a) Simplify    $a^{20} \times a^{5}$

Answer $\underline{a^{25}}$

The perimeter of the rectangle is 37 cm.

$x + 3$

$x \qquad\qquad\qquad x$

Work out the value of $x$.

$x + x + x + 3 + x + 3 = 37$

$4x + 6 = 37$    $(-6)$

$4x = 31$    $(\div 4)$

$\underline{x = \dfrac{31}{4}}$

(b) Simplify    $\dfrac{a^{20}}{a^{5}}$
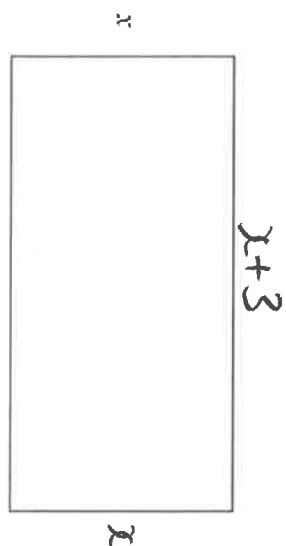
Answer $\underline{a^{15}}$

(c) Simplify    $(a^{20})^{5}$

Answer $\underline{a^{100}}$

(b) Factorise fully    $4t - 20$

$\underline{4(t - 5)}$

Answer ..............

A, B, C and D represent different numbers.
The total for each row is shown.

| A | A | A | A | 24 |
|---|---|---|---|----|
| A6 | A6 | B | B | 22 |
| A6 | B5 | B5 | C | 26 |
| A6 | B5 | C16 | D | 28 |
|   |   |   | Total |  |

$4a = 24$  $(\div 4)$
$a = 6$

$2b + 12 = 22$
$2b = 10$
$b = 5$

$16 + 16 = 2C (-16)$
$C = 10$

$21 + d = 28$
$d = 7$

Work out the values of A, B, C and D.

$a = 6 , \quad b = 5, \quad c = 10$

$\underline{d = 7}$

_Answers_

# Solid algebra exam questions

**(a)** A sequence starts 5, 13, 21, 29

$+8$ $+8$ $+8$

Circle the expression for the $n$th term.

$8 - 3n$ $\qquad$ $8n + 5$ $\qquad$ $(8n - 3)$ $\qquad$ $5n + 8$

**(b)** The term-to-term rule for a different sequence is

| Multiply the previous term by 2 then subtract 5 |
|---|

The second term in this sequence is $2x + 7$

The sum of the first three terms is 57

Work out the value of $x$.

$\boxed{x = 5}$

① $x + 6$

② $2x + 7$

③ $2(x+7) - 5 = 2x + 14 - 5 = 2x + 9$

① ⟶ $\boxed{\times 2}$ ⟶ $\boxed{-5}$ ⟶ $2x + 7$ **(b)** Factorise $y^2 + 2y - 24$

$x + 6$ ⟵ $\boxed{\div 2}$ ⟵ $\boxed{+5}$ ⟵ $2x + 7$ $\quad (y + 6)(y - 4)$

$\underline{\underline{x + 6}}$ ↑ $2x + 12$

① $\quad$ ② $\quad$ ③

$x + 6 + 2x + 7 + 4x + 9 = 57$

$7x + 22 = 57 \quad (-22)$

$7x = 35 \quad (\div 7)$

$\underline{\underline{x = 5}}$

**(a)** Expand and simplify $\quad (3x + 2)(2x + 5)$

$6x^2 + 15x + 4x + 10$

$\underline{\underline{6x^2 + 19x + 10}}$ $\qquad$ Answer

**(b)** Simplify fully $\quad (3x^2 y^4)^2 = (3x^2 y^4)(3x^2 y^4)$

$\underline{9x^4 y^8}$

Circle the equation with roots 4 and −8

$4x(x - 8) = 0 \qquad (x - 4)(x + 8) = 0$

$x^2 - 32 = 0 \qquad \boxed{(x + 4)(x - 8) = 0}$

Solve the simultaneous equations

$5x + 6y = 30$ ①

$2x - 3y = 12$ ② $\times 2$

Sub $x = 3$ into eqn ②

$6 - 3y = 12$

$-3y = 6 \; (\div -3)$

$\underline{y = -2}$

You **must** show your working.

Do **not** use trial and improvement.

$5x + 6y = 3$

$\dfrac{+ \; 4x - 6y = 24}{9x = 27}$

$x = 3, \; y = -2$

**(a)** Expand and simplify $\quad (2x + 1)(x - 3)$

$2x^2 - 6x + x - 3$

$\underline{\underline{2x^2 - 5x - 3}}$ $\qquad$ Answer

# Handling Data

From the frequency diagram calculate the:

| Number of Siblings | Frequency | Siblings |
|---|---|---|
| 0 | × 5 | 0 |
| 1 | × 7 | 7 |
| 2 | × 8 | 16 |
| 3 | × 4 | 12 |
| 4 | × 2 | 8 |
| 5 | × 1 | 5 |
| | 27 | 48 |

a. Mean → $\frac{48}{27}$

b. Median → 2

c. Mode → 2

d. Range → 5 − 0 = 5

1. A fair coin is flipped 600 times. How many times would you expect to get a tail? $\frac{1}{2}$ of 600 = 300

2. A dice is rolled 120 times. How many times would you expect to get a 3? $\frac{1}{6}$ of 120 = 20

3. The probability of picking a blue counter from a bag is $\frac{1}{3}$. How many times would you expect to pick a blue counter if you picked 150 counters, putting them back each time? $\frac{1}{3}$ of 150 = 50

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You have 4 cards. Write down the numbers that could be on the cards so that:

a. They have a range of 8   1, 2, 3, 9
b. They have a median of 6.   1, 6, 6, 7
They have a mode of 7 and a range of 6.   1, 6, 6, 7
They have a mean of 8 and a range of 10.   5, 5, 7, 7, 16

4, 7, 7, 14

? ? ? ?

Calculate the theoretical probability of picking a red counter.
$\frac{120}{500} = \frac{24}{100} = \frac{12}{50} = \frac{6}{25}$

| Number of trials | 100 | 200 | 300 | 400 | 500 |
|---|---|---|---|---|---|
| Number of reds | 14 | 34 | 81 | 92 | 120 |
| Relative frequency | $\frac{14}{100}$ | $\frac{34}{200}$ | $\frac{81}{300}$ | $\frac{92}{400}$ | $\frac{120}{500}$ |

I choose counters from a bag containing 2 red, 2 blue, 2 green, and 2 yellow counters.
Complete the table to find the relative frequencies.

$\frac{2}{6}$ $\frac{6}{1600}$ $\frac{2}{1800}$ $\frac{3}{1860}$ $\frac{4}{1600}$ $\frac{5}{1460}$ $\frac{4}{600}$ $\frac{7}{900}$ $\frac{8}{400}$

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1. A fair dice is rolled twice. Find the probability of:
a. Rolling a 5 and then a 6.  $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$
b. Rolling an even number and then an even number
c. Rolling an odd number and then a prime number.

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

The table shows some information about the age and price of some motorbikes.
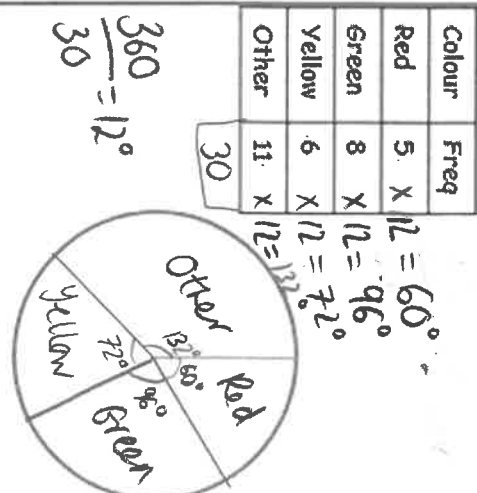Draw a scatter diagram for the information.

Price (£)

a. Draw the line of best fit on the scatter graph.
b. Use your line to predict:
i. The percentage attendance of a student who scored 80. 83%
ii. The score of someone with 60% attendance. 50%
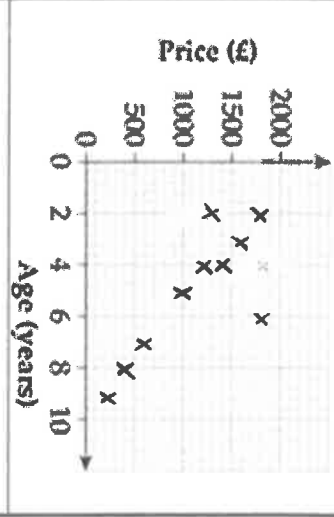
Maths test result

Maths test results and percentage attendance

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Complete the pie chart for students' favourite colour.

| Colour | Freq | |
|---|---|---|
| Red | 5 | × 12 = 60° |
| Green | 8 | × 12 = 96° |
| Yellow | 6 | × 12 = 72° |
| Other | 11 | × 12 = 132° |
| | 30 | |

$\frac{360}{30} = 12°$

The pie chart shows information about the favourite milkshake flavour of some students. 15 students like strawberry the best.
a. How many students like chocolate the best?
b. How many students like banana the best?

Favourite milkshake flavour
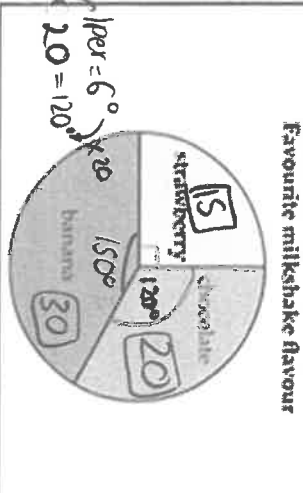
$90° = 15$ peeps   ÷15
$6° = 1$ peep   } ÷15
$\times 30$   $150° = 30$ peeps   × 30

$1$ per $= 6°$
$20 = 120°$

# Handling Data Exam Questions

*Answers*

Boxes A, B, C and D contain balls with numbers on them.

**Box A**
① ③ ② ① ②

**Box B**
① ③ ②

**Box C**
① ② ③ ② ③
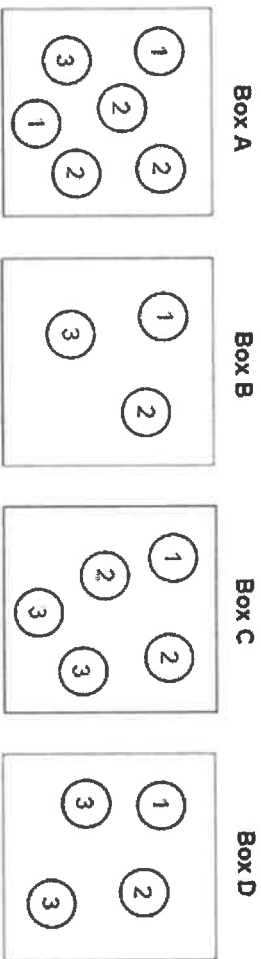
**Box D**
① ③ ② ③

A ball is picked at random from each box.

(a)  Which box gives the **greatest** chance of picking a 3?

You **must** show your working.

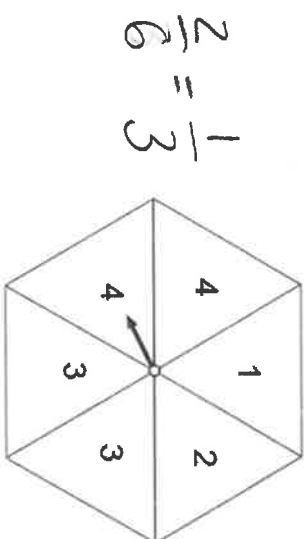$$\underline{Box\,A} \qquad \underline{Box\,B} \qquad \underline{Box\,C} \qquad \underline{Box\,D}$$

$$\frac{1}{6} = \frac{5}{30} \qquad \frac{1}{3} = \frac{10}{30} \qquad \frac{2}{5} = \frac{12}{30} \qquad \frac{1}{2} = \frac{15}{30} \leftarrow \text{biggest!}$$

(Box D) ← biggest!

Box ........**Box D**........

(b)  Which two boxes give the same chance of picking a 1?

$$\underline{Box\,A} \qquad \underline{Box\,B} \qquad \underline{Box\,C} \qquad \underline{Box\,D}$$

$$\frac{2}{6} = \frac{1}{3} \qquad \frac{1}{3} \qquad \frac{1}{5} \qquad \frac{1}{4}$$

Box ....**A**.... and Box ....**B**....

(a)  The arrow on this spinner is equally likely to land on each section.

Spinner sections: 4, 1, 2, 3, 3, 4

$$\frac{2}{6} = \frac{1}{3}$$

The arrow is spun 72 times.

How many times do you expect the arrow to land on 4?

$$\frac{1}{3} \text{ of } 72 = \underline{24}$$

Answer ......**24**......

(a)  Ian sells cans of drinks.

The table shows the percentages of drinks sold on Monday m

| Drink | Percentage Sold |
|-------|-----------------|
| Cola | 30% |
| Lemonade | 20% |
| Orange | 50% |

Draw a pie chart for the data.

30% of 360 = 108°
20% of 360 = 72°
50% of 360 = 180°

Pie chart: Orange, Cola, lemonade
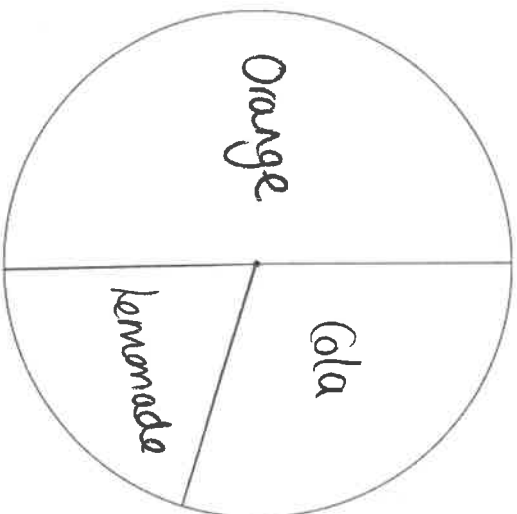
# Solid Handling Data Exam Questions

**Answers**

Here is a Venn diagram.
It shows information about the number of students who have a laptop or a TV.

Set L represents students with a laptop.
Set T represents students with a TV.

total = 50

ξ
L        T
6     23     11
              10
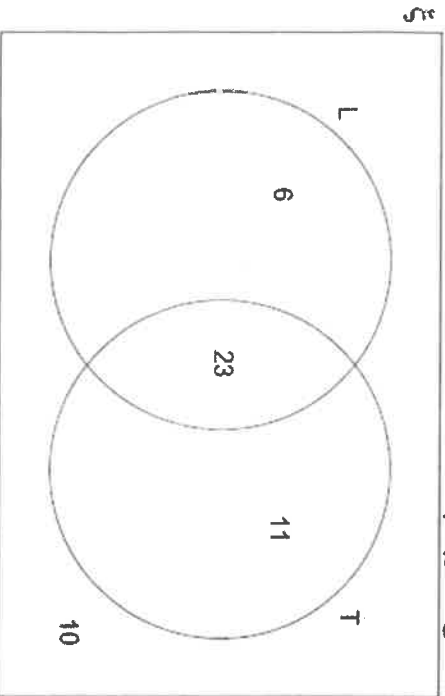
There are 50 students altogether.

A student is chosen at random.

(a)  Work out the probability that the student has a laptop.

Answer  (6+23=29)   $\frac{29}{50}$

(b)  Work out the probability that the student has a laptop and a TV.

Answer   $\frac{23}{50}$

(c)  Complete the sentence to make it true.

The probability that the student ..only has a TV..

.......... is $\frac{11}{50}$

---

A bag contains counters that are red, blue, green or yellow.

| Number of counters | red | blue | green | yellow |
|---|---|---|---|---|
| | 9 | 3x | x − 5 | 2x |

$3x + x - 5 + 2x = 91$
$6x - 5 = 91 \quad (+5)$
$6x = 96 \quad (\div 6)$
$x = 16$

A counter is chosen at random.

The probability it is **red** is $\frac{9}{100}$

Work out the probability it is **green**.

$100 - 9 = 91$ $\frac{91}{100}$

green $= x - 5$

$= 16 - 5 = 11$

(a)  Complete the tree diagram for the dice landing on 4

First spin        Second spin

$\frac{1}{6}$  4

$\frac{1}{6}$ 4

$\frac{5}{6}$ not 4

$\frac{5}{6}$ not 4

$\frac{1}{6}$ 4

$\frac{5}{6}$ not 4
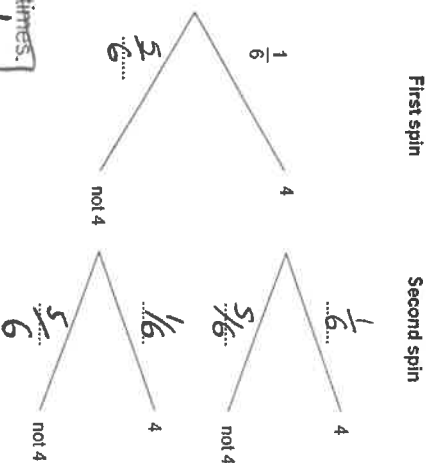
(b)  Work out the probability of the dice landing on 4 both times.

$P(4 \text{ and } 4) = \frac{1}{6} \times \frac{1}{6} = \boxed{\frac{1}{36}}$

Answer .......................

# Shape and Space

| Shape | Formula for Area | Area | Perimeter |
|---|---|---|---|
| 3cm × 3cm | $A = l^2$ | $A = 3 \times 3$ $= 9cm^2$ | $P = 3+3$ $+3+3$ $= 12cm$ |
| 2cm × 5cm | $A = l \times w$ | $A = 2 \times 5$ $= 10cm^2$ | $P = 2+2$ $+5+5$ $= 14cm$ |
| 4m triangle 3m | $A = \dfrac{b \times h}{2}$ | $A = \dfrac{4 \times 4}{2}$ $= 8cm^2$ | $P = 3+3+$ $4$ $= 10cm$ |
| 5cm 7cm parallelogram | $A = b \times h$ | $A = 7 \times 5$ $= 35cm^2$ | $P = 6+6$ $+7+7$ $= 26cm$ |
| 3m 2m 3m 5m trapezium | $A = \frac{1}{2}(a+b)h$ $A = \frac{1}{2}(2+5)4$ $A = \frac{1}{2} \times 7 \times 4$ $= 14cm^2$ | | $P = 2+3+$ $3+5$ $= 13cm$ |

## Calculate the volume of the prisms.
### All lengths are in centimetres.

$3 \times 8 \times 5 - 2 = 124.8cm^3$

$47.3 \times 6.8 \times 2 = 620.5cm^3$

$15 \times 9.2 \times 4.3 = 593.4cm$

$9.6 \times 4 \times 12.5 = 480cm^3$

**Find the missing angles:**

$(180 - 51 - 90)$ $= 39°$

$51°$  $a$  $39°$

$17°$ $120°$ $80°$ $112°$ $31°$ $b$

$116°$ $62°$ $c$ $d$ $e$ $118°$ $62°$

$113°$ $113°$ $113°$ $g$ $67°$ $f$ $h$

2.

| $3x$ | |
|---|---|
| | $x+5$ |

$3 \times 9 = 27$

$3x$ $x+5$

a. Write an equation for the perimeter of the rectangle.

$3x + 3x + x + 5 + x + 5 = 82$

$8x + 10 = 82 \quad (-10)$

$8x = 72 \quad (\div 8)$

$x = 9$
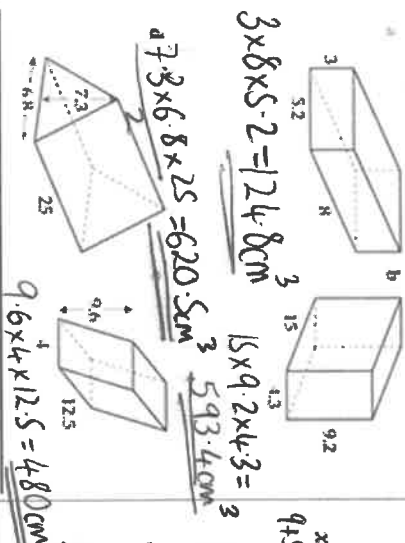
The perimeter of the rectangle is 82cm.

b. Solve your equation to find the value of x. Hence find the length of each side.
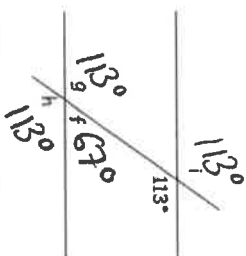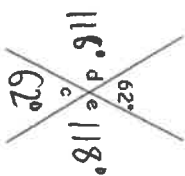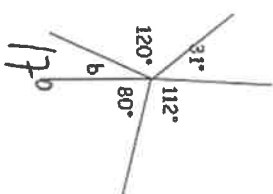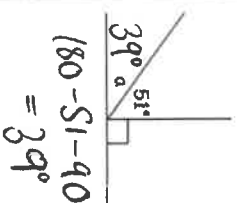
**Find the length of the hypotenuse of the triangles:**

$5^2 + 4^2 = 41$ $25 + 16 = 41$ $\sqrt{41}$

4cm  5cm

$11^2 + 9^2 = 121 + 81 = 202$ $\sqrt{202}$

9cm  11cm  $b$
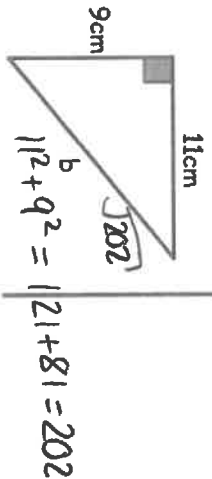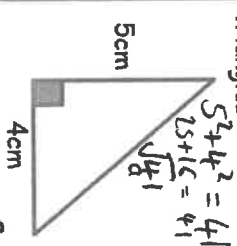
## Calculate the surface area of the prisms.
### All lengths are in centimetres.

a

① $10 \times 5 \ (2)$
② $6 \times 5 \ (2)$
③ $6 \times 10 \ (2)$
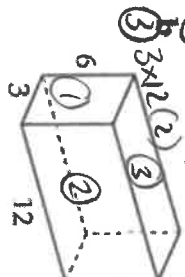
$50 \times 2 + 30 \times 2 + 60 \times 2$ $= 280cm^2$

① $6 \times 3 \ (2)$
② $6 \times 12 \ (2)$
③ $3 \times 12 \ (2)$

$18 \times 2 + 72 \times 2 + 36 \times 2$ $= 252cm^2$

# Answers

## Reflection and Rotation

Reflect the shape A in the line $y = 1$. Label the image B.



$y = 1$

Triangle T is drawn on the grid.

Draw the image of T after a rotation of 90° anticlockwise about O.
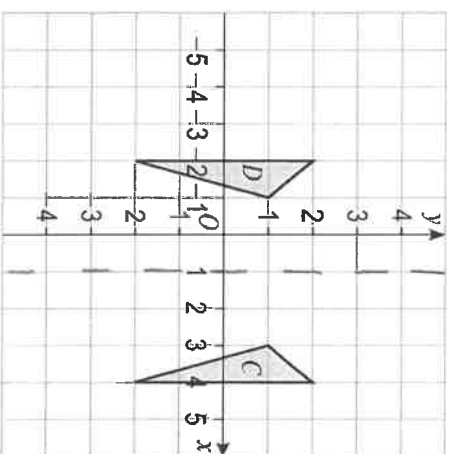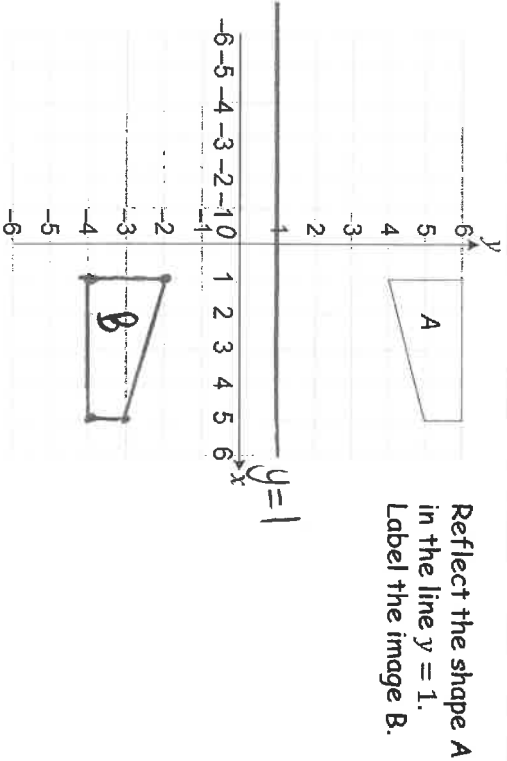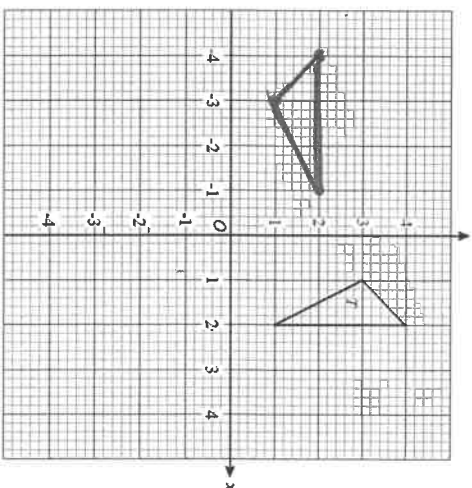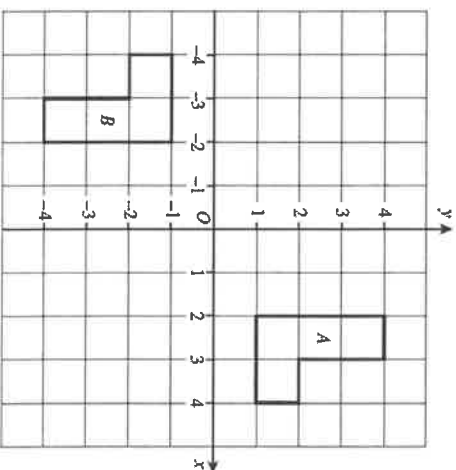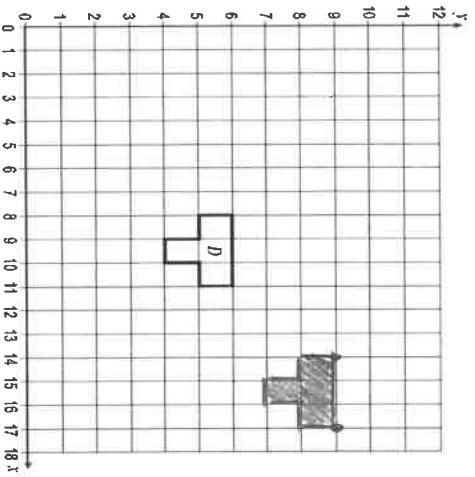


In the diagram, the triangle D is the image of triangle C after a reflection in a mirror line.

(i) Draw the mirror line on the diagram using a dashed line.

(ii) Write down the equation of the mirror line.

$X = 1$



Describe fully the single transformation which takes shape A onto shape B.

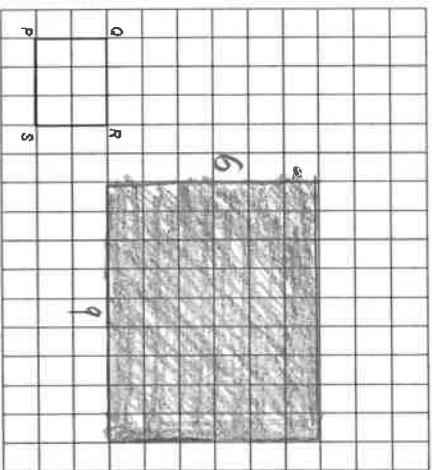Rotation 180° clockwise around centre (0,0).

Answers

Translate shape D by vector $\begin{pmatrix} 6 \\ 3 \end{pmatrix}$.

Label the new shape E.
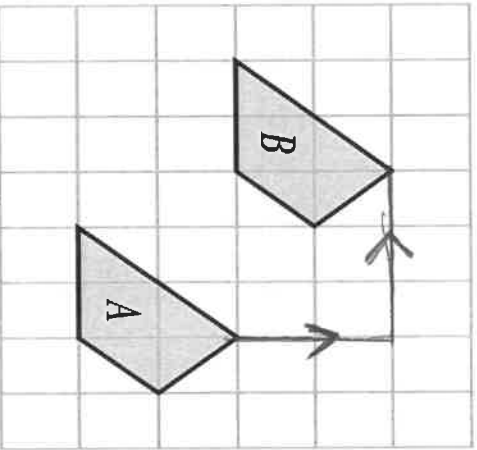


In the diagram, shape A has been translated to shape B.

Describe the transformation that takes shape A to shape B.
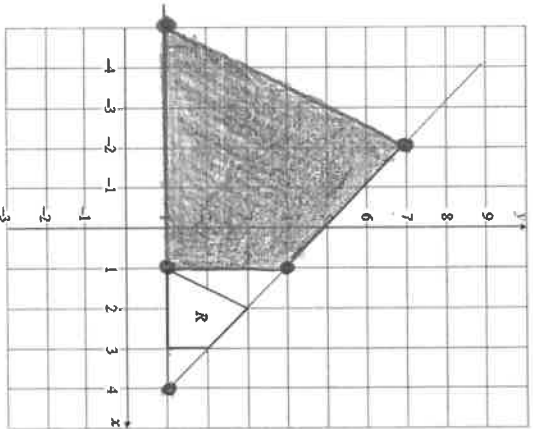
$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$



Enlarge PQRS by scale factor 3.

How many times bigger is the area of the enlarged shape than the area of PQRS?

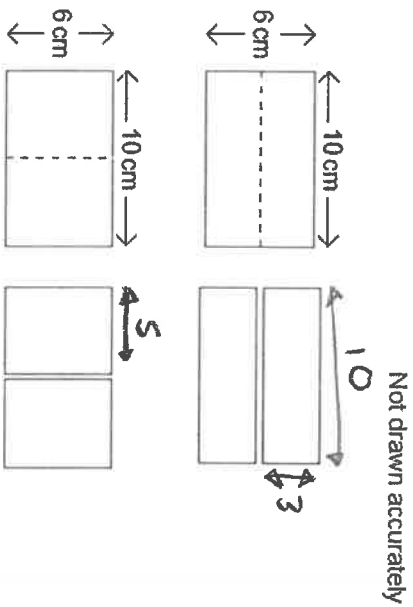$6 \times 9 = 54$

The area is 9 times bigger



Enlarge shape R by scale factor of 3, centre of enlargement (4,1).

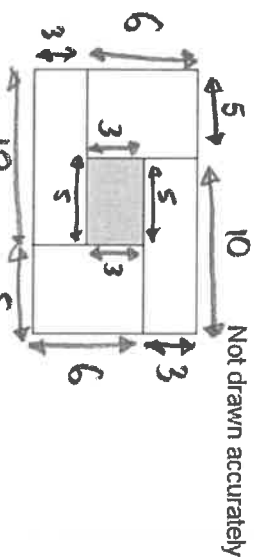# Shape and Space Exam Questions

*Answers*

Two 10 cm by 6 cm rectangles are cut in half as shown.

Not drawn accurately

6cm → ← 10cm →

6cm → ← 10cm →

10

3

Work out the area of this pentagon.

Not drawn accurately

① 10 × 12 = 120cm²

② 6 × 10 = 30cm²
   ── 
    2

10cm

12 cm

18 cm

6cm

①

②

total

150cm²

The four pieces are joined together, without overlap, as shown.

Not drawn accurately

6cm → ← 10cm →

5

6cm → ← 10cm →

(a) Which angles are vertically opposite?
    Circle your answer

    ⟨a and b⟩     a and c     b and c     c and d

(b) Which angles are alternate?
    Circle your answer

    a and b     a and c     ⟨b and c⟩     b and d     c and d

The four pieces are joined together, without overlap, as shown.

Not drawn accurately

6
3
5
3
5
5
3
3
6
5
10
6
10

Work out the perimeter of the shaded rectangle.

5+5+3+3 = 16cm

(c) Which angles are corresponding?
    Circle your answer

    a and b     ⟨a and c⟩     b and c     b and d     c and d

a
b
c
d

(1)

(1)

(1)

# Solid Shape and Space Exam Questions

The exterior angle of a regular polygon is 45°.

Circle the name of the regular polygon.

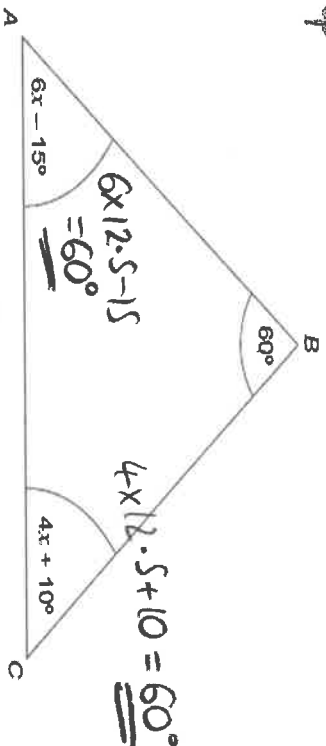pentagon          hexagon          (octagon)          decagon

$360 ÷ 45° = 8$

(All exterior angles?
regular shapes add up
to 360°)

---

(a)   Three electric cars are tested by driving them around a track until the battery runs out.

The table shows some information about their performance.

| Car | Total time travelled (hours) | Average speed (km/h) | Total distance travelled (km) |
|-----|------|------|------|
| A | 4 | 35 | $4 × 35 = 140$km |
| B | $180 ÷ 40 = 4.5$ | 40 | 180 |
| C | 3 | $150 ÷ 3 = 50$ | 150 |

Complete the table.

---

(b)   Two cars are driven around a 10 kilometre track.
Both cars leave from the start line at the same time.
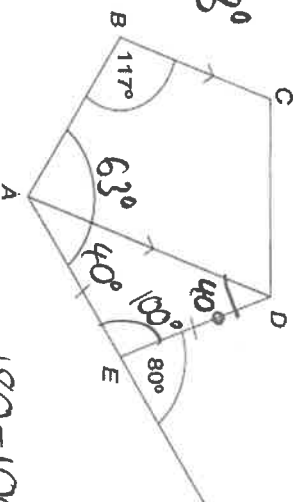
Car X travels at exactly 40 km/h → takes 15 mins to do track
Car Y travels at exactly 30 km/h → takes 20 mins to do track

How many minutes will it be before they pass the start line together again?

$180 - 117 = 63°$

15: 15, 30, 45, 60
20: 20, 40, 60

**60 minutes**

---

Show that ABC is an equilateral triangle.

Not drawn accurately



$6x - 15$

$60 + 6x - 15 + 4x + 10 = 180$
$10x + 55 = 180$  (-55)
$10x = 125$
$x = 12.5$

$6 × 12.5 - 15$
$= 60°$

$4 × 12.5 + 10 = 60°$

---

AB is parallel to BC.

AE = DE

Not drawn accurately

Work out the size of angle BAE.



$180 - 100 = 80°$
$80 ÷ 2 = 40°$

Triangle DAE is isosceles

Angle BAE = $63 + 40 = $  103°