# Educate.ie Sample 1

# Paper 1

**1.**

| **Percentages** | 50% | 75% | 25% | $33\frac{1}{3}\%$ | 30% | 20% |
|---|---|---|---|---|---|---|
| **Fractions** | $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{1}{4}$ | $\frac{1}{3}$ | $\frac{3}{10}$ | $\frac{1}{5}$ |
| **Decimal** | 0·5 | 0·75 | 0·25 | 0·33 | 0·3 | 0·2 |

**2.** **(a)** **(i)** $(A \cap B)$

{4, 2}

This is A intersection B i.e. the elements in A and B.

**(ii)** $(A \cup B)^c$

{12}

This is the complement of A union B, the elements outside A and B.
This can also be written as $(A \cup B)'$

**(iii)** $(A \setminus B)$

{1, 3, 5}

This is A less B i.e. the elements in A without the elements in B.

**(b)** **(i)** # $(A \cup B)$

7

The # symbol means you count the elements in that section.

**(ii)** # $(B \setminus A)$

2

**(iii)** # B

4

**3.** **(a)** Principal year 1 = €10 000

Interest year 1 = €150 ← 10 000 × 0·015

Principal year 2 = €10 150

Interest year 2 = €203 ← 10 150 × 0·02

Principal year 3 = €10 353

Interest year 3 = €207·06 ← 10 353 × 0·02

After 3 years = €10 560·06

Total after 3 years = €10 560·06

**(b)** Total dividend = Total − €10 000

After 3 years = €10 560·06 − €10 000 ← Interest = Total − Principal

Total dividend = €560·06

**4.** **(a)** Gross income tax = 20% of €650 = €130

Net income tax = Gross income tax – tax credits

Net income tax = €130 – €60

Net income tax = €70

**(b)** 2% of €193 + 4% of €115 + 7% of €342

€3·86 + €4·60 + €23·94

€32·40

**(c)** 4% of €650

€26

**(d)** €650 – (€70 + €32·40 + €26) ← Net income = Gross income – All deductions

€521·60

**5.** **(a)**

| | $2x$ | $5$ |
|---|---|---|
| $3x$ | $6x^2$ | $15x$ |
| $4$ | $8x$ | $20$ |

← Area = Length × Breadth
Get area of each small rectangle and add all to find the total area.

Total area = $6x^2 + 15x + 8x + 20$

$= 6x^2 + 23x + 20$

$= (2x + 5)(3x + 4)$ ← Verifying answer by multiplying brackets

$= 6x^2 + 8x + 15x + 20$

$= 6x^2 + 23x + 20$

**(b)**

$$2x - 3 \overline{)\, 8x^2 - 26x + 21}$$

$4x - 7$

$8x^2 - 12x$

$-14x + 21$

$-14x + 21$

Method 2

$-26x$

| | $4x$ | $-7$ |
|---|---|---|
| $2x$ | $8x^2$ | $-14x$ |
| $-3$ | $-12x$ | $21$ |

Answer $4x - 7$

**6.** **(a)** $2a^2b$

$2\left(\frac{1}{2}\right)^2\left(\frac{1}{4}\right)$ ← Use brackets to help in substitution.

$2\left(\frac{1}{4}\right)\left(\frac{1}{4}\right)$

$\frac{2}{16} = \frac{1}{8} = 0{\cdot}125$

**(b)** **(i)** $x^2 - 81$ ← Difference of two squares

$(x + 9)(x - 9)$

**(ii)** $x^2 - 8x - 9$ ← Quadratic factors

$(x - 9)(x + 1)$

**(c)** $\dfrac{x^2-8x-9}{x^2-81} \Rightarrow \dfrac{(x-9)(x+1)}{(x+9)(x-9)} \quad \therefore \dfrac{x+1}{x+9}$ ← Use **(b)** parts **(i)** and **(ii)**.

for $x = 3$

$\dfrac{3+1}{3+9} = \dfrac{4}{12} = \dfrac{1}{3}$

**7. (a)**

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| 2 | 4 | 6 | 8 | 10 | 12 |

Adding 2 to each term to get the next

**(b)**

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| 2 | 4 | 16 | 256 | 65 536 | 4 294 967 296 |

$16 \times 16 = 256$ $\quad$ $65\,536 \times 65\,536$

**(c)**

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| 2 | 6 | 38 | 1446 | 2 090 918 | $4{\cdot}37 \times 10^{12}$ |

$6^2 + 2 = 38$ $\quad$ $1446^2 + 2 = 2\,090\,918$

**(d)**

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 |
|---|---|---|---|---|
| 2 | 16 | 324 | 106 276 | $1{\cdot}1295 \times 10^{10}$ |

$2 + 2 = 4$, $4^2 = 16$ $\quad$ $324 + 2 = 326$, $326^2 = 106\,276$

**8. (a)** Yes

$6(x-2) = 4(x-1)$

$6(4-2) = 4(4-1)$

$12 = 12$

or solve equation

$6(x-2) = 4(x-1)$

$6x - 12 = 4x - 4$

$2x = 8$

$x = 4$

**(b)** Yes

$x^2 - 16 = 0$

$4^2 - 16 = 0$

$16 - 16 = 0$

$0 = 0$

or solve equation

$x^2 - 16 = 0$

$(x+4)(x-4)$

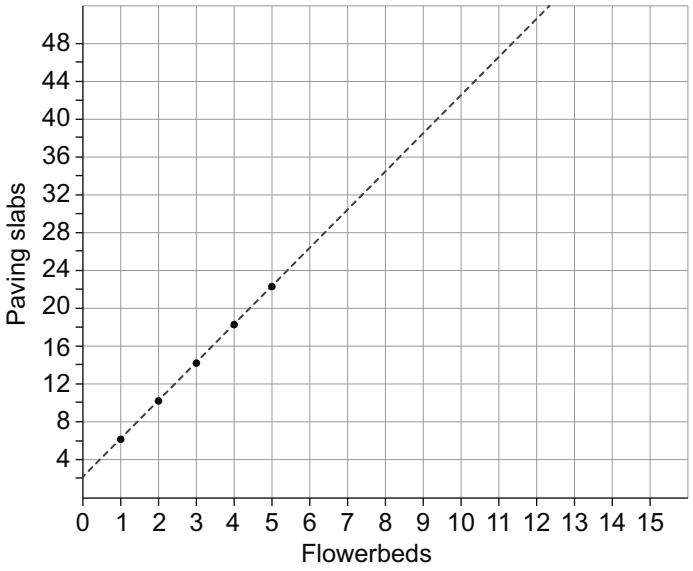
$x = -4$ or $x = 4$

**9. (a)**

| No. of flowerbeds | No. of paving slabs |
|---|---|
| 1 | 6 |
| 2 | 10 |
| 3 | 14 |
| 4 | 18 |
| 5 | 22 |

← Adding 4 each time

**(b)**




**(c)** Yes

**Reason:** All couples are on a line or there is a constant difference between the number of paving slabs.

**10. (a)**


**(b)**


**11.** $x + y = 4$ and $2x + y = 2$

$\Rightarrow y = 4 - x$

$\Rightarrow 2x + (4 - x) = 2$

$\Rightarrow 2x + 4 - x = 2$

$\Rightarrow x = -2$

$\Rightarrow y = 4 - (-2)$

$\Rightarrow y = 6$

or

$x + y = 4$

$2x + y = 2$

$-x \quad = 2$

$\Rightarrow x = -2$

$\Rightarrow (-2) + y = 4$

$\Rightarrow y = 6$

**12. (a)**

| Country | Population |
|---|---|
| China | $1{\cdot}4 \times 10^9$ |
| India | $1{\cdot}2 \times 10^9$ |
| United States | $3{\cdot}2 \times 10^8$ |
| Germany | $8{\cdot}1 \times 10^7$ |
| United Kingdom | $6{\cdot}3 \times 10^7$ |
| Romania | $2{\cdot}1 \times 10^7$ |
| Republic of Ireland | $4{\cdot}6 \times 10^6$ |
| New Zealand | $4{\cdot}5 \times 10^6$ |
| Lithuania | $3{\cdot}0 \times 10^6$ |

**(b)** $\dfrac{3{\cdot}2 \times 10^8}{9{\cdot}1 \times 10^6} = \dfrac{3{\cdot}2 \times 10^2}{9{\cdot}1} = 35{\cdot}16$ people/km$^2$

**(c)** $\dfrac{1{\cdot}4 \times 10^9}{7{\cdot}1 \times 10^9} \times \dfrac{100}{1} = 19{\cdot}7\%$

**13. (a) Solution 1:**

| Number | 5 times the number | 3 added to 5 times the number |
|---|---|---|
| 1 | $1 \times 5 = 5$ | $5 + 3 = 8$ |
| 2 | $2 \times 5 = 10$ | $10 + 3 = 13$ |
| 3 | $3 \times 5 = 15$ | $15 + 3 = 18$ |
| 4 | $4 \times 5 = 20$ | $20 + 3 = 23$ |

**(b) Solution 2:**

$23 - 3 = 20$

$20 \div 5 = 4$

**(c) Solution 3:**

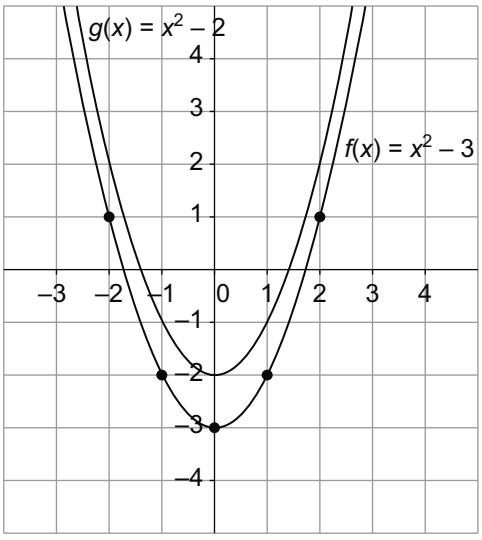
$5x + 3 = 23$

$5x = 20$

$x = 4$

**14. (a)** **(i)** $f(-2) = (-2)^2 - 3 = 1$ (ii) $f(2) = (2)^2 - 3 = 1$

**(b)**




**(c)** Shown on the diagram above

# Educate.ie Sample 2

# Paper 1

**1. (a)** $34 \times 10 = 340$ mm ← 10 mm = 1 cm

**(b)** $12 \times 1000 = 12\,000$ grams ← 1000 grams = 1 kg

**(c)** $2{\cdot}4 \times 1000 = 2400$ cm$^3$ ← 1000 cm$^3$ = 1 litre

**(d)** $3\,000\,000 \div 1\,000\,000 = 3$ tonnes ← 1 000 000 cm$^3$ = 1 tonne

**2. (a)** $\frac{1}{4}\ \ \frac{1}{3}\ \ \frac{3}{8}\ \ \frac{3}{5}\ \ \frac{3}{4}\ \ \frac{5}{6}$ ← It might be best to change all to the same common denominator.

**(b)** $\frac{1}{5}+\frac{1}{6}=\frac{11}{30}$ $\quad \frac{11}{30}\div 2=\frac{11}{60}$

**(c)** 1:5 That is $\frac{1}{6}$ of orange juice and $\frac{5}{6}$ of water.

Orange juice needed to make 3 litres $= \frac{1}{6}$ of $2 = \frac{1}{3}$ litre

**3. (a)** 28% = 18 312

$1\% = \frac{18\,312}{28}$ ← This is called the unitary method. Work back through 1%.

$100\% = \frac{18\,312}{28} \times 100 = 65\,400$

**(b)** $65\,400 \times 0{\cdot}005 = 327$: Population in 2012 $= 65\,400 - 327 = 65\,073$

0·5% = 0·5 ÷ 100 = 0·005

**4. (a)** **(i)** 12 [÷] 3 [+] 4 = 8

**(ii)** 12 [÷] 6 [−] 2 = 0

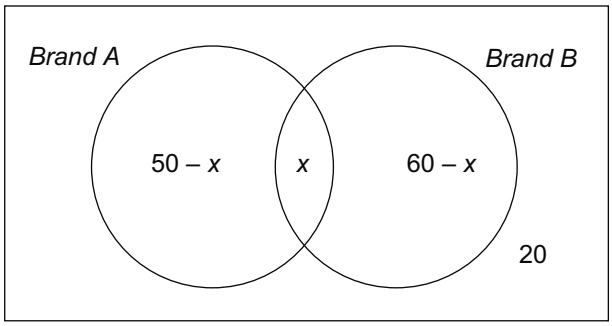
**(b)** List: 1, 2, 3, 4, 6, 8, 12, 24

**(c)**
$$\begin{array}{r|l} 3 & 63 \\ \hline 3 & 21 \\ \hline & 7 \end{array}$$

Prime factors = 3 × 3 × 7

If you have a Casio calculator (NATURAL – V.P.A.M) to find the prime factors of 63: Type in 63 and press the equals button. Then press  and the prime factors will show up as $3^2 \times 7$.

**5.**




**(a)** $50 - x + x + 60 - x + 20 = 100 \quad \Rightarrow x = 30$

**(b)** $60 - 30 = 30$

**6. (a)** $25 \in B$ True ☐ False ✓

**(b)** $B \subset A$ True ☐ False ✓

**(c)** $\#A = 6$ True ✓ False ☐

**(d)** $\{8, 10\} \subset B$ True ✓ False ☐

**(e)** $\varnothing \subset A$ True ✓ False ☐

**(f)** $A \cap B = \{10\}$ True ✓ False ☐

$\varnothing \subset A$: This means that the null set is a subset of A. This is true because the null set is a subset of all sets.

**7. (a)** €3·213 ← 0·1071 × 30

€5·082 ← 0·2541 × 20

€15·603 ← 0·5201 × 30

€0·406 ← 0·0203 × 20

**(b)** Total cost: €24·30

**(c)** Credit at beginning of week = €25·25: Credit at end of week = €25·25 − €24·30 = €0·95

**8.** Gross tax: 20% of €25 250 = €5050 ← 0·2 × 25 250

Net tax: €5050 − €1530 = €3520

**9.**

| Statement | True | False | Reason |
|---|---|---|---|
| If a set $A = \{x \mid -4 < x \leq 3,\ x \in Z\}$, then $-4 \in A$ | | ✓ | $x$ is greater than –4. The inequality sign does not include an equal sign. |
| If a set $A = \{x \mid -4 < x \leq 3,\ x \in N\}$, then $-3 \in A$ | | ✓ | −3 is not a natural number. |
| If a set $A = \{x \mid -4 < x \leq 3,\ x \in R\}$, then $2{\cdot}5 \in A$ | ✓ | | 2·5 is a real number greater than –4 and less than or equal to 3. |
| If a set $A = \{x \mid -4 < x \leq 3,\ x \in Z\}$, then $3 \in A$ | ✓ | | 3 is an integer greater than –4 and less than or equal to 3. |

**10. (a)** $x^2 - 10x + 9$

$(x - 9)(x - 1)$ ← Quadratic factors

**(b)** $x^2 - 10x + 9 = 0$

$(x - 9)(x - 1) = 0$

$x - 9 = 0$ or $x - 1 = 0$

$x = 9$ or $x = 1$

**(c)**

| $x = 9$ | or | $x = 1$ |
|---|---|---|
| $(9)^2 - 10(9) + 9 = 0$ | | $(1)^2 - 10(1) + 9 = 0$ |
| $81 - 90 + 9 = 0$ | | $1 - 10 + 9 = 0$ |
| $0 = 0$ | | $0 = 0$ |
| $\therefore x = 9$ is a solution | | $\therefore x = 1$ is a solution |

**11. (a)** **(i)** 3, 6, 9, 12, 15, 18, ← Adding 3 to get the next term

**(ii)** 7, 4, 1, −2, −5, −8, ← Adding −3 to get the next term

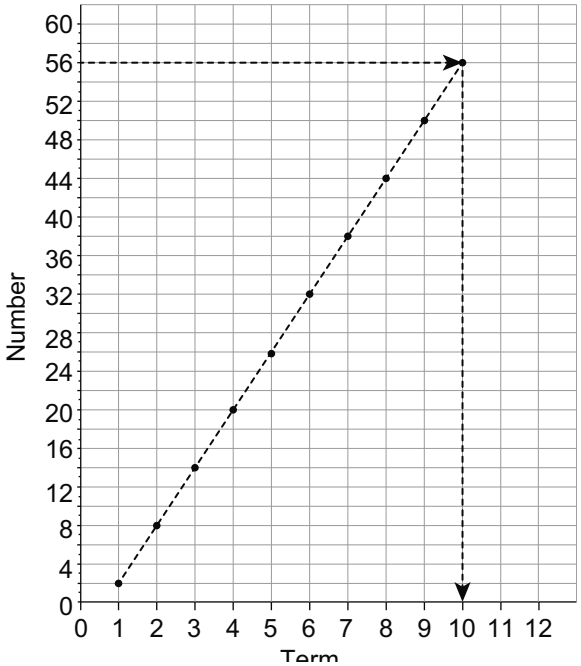
**(iii)** 1, 8, 27, 64, 125, 216, ← $1^3, 2^3, 3^3, 4^3, 5^3, 6^3$

**(b)**

| Term | Sequence | Pattern | Couple |
|---|---|---|---|
| 1 | 2 | $6(1) - 4$ | (1, 2) |
| 2 | 8 | $6(2) - 4$ | (2, 8) |
| 3 | 14 | $6(3) - 4$ | (3, 14) |
| 4 | 20 | $6(4) - 4$ | (4, 20) |
| 5 | 26 | $6(5) - 4$ | (5, 26) |
| 6 | 32 | $6(6) - 4$ | (6, 32) |

**(c)** $8^{th}$ term: $6(8) - 4 = 44$

**(d)**



**(e)** See lines on diagram above. $10^{th}$ term

**12. (a)**

| **Cylinder** | A | B | C | D |
|---|---|---|---|---|
| **Graph** | 4 | 2 | 1 | 3 |

**(b)** 8 cm

**(c)** 6 cm

**(d)** Cylinder A: $\frac{\text{Rise}}{\text{Run}} = \frac{8}{20} = 0{\cdot}4$ cm/sec

Cylinder B: $\frac{\text{Rise}}{\text{Run}} = \frac{8}{5} = 1{\cdot}6$ cm/sec

Cylinder C: $\frac{\text{Rise}}{\text{Run}} = \frac{8}{3} = 2\frac{2}{3}$ cm/sec

Cylinder D: $\frac{\text{Rise}}{\text{Run}} = \frac{8}{10} = 0{\cdot}8$ cm/sec

**13. (a)** $ab - 2b$ ← Common factor: $b$ is common.

$b(a - 2)$

**(b)** $3m - 9mn$ ← Common factor: $3m$ is common.

$3m(1 - 3n)$

**(c)** $t^2 - 25$ ← Difference of two squares

$(t + 5)(t - 5)$

**14. (a)**

| **Name** | **Statement** | **Age (A)** |
|---|---|---|
| Alan | Three years older than Tommy | $A = y + 3$ |
| Donnacha | Four years younger than Tommy | $A = y - 4$ |
| Cillian | Double Alan's age | $A = 2(y + 3)$ |
| Oliver | Half Donnacha's age | $A = (y - 4) \div 2$ |
| Shane | Two years older than Oliver | $A = [(y - 4) \div 2] + 2$ |

**(b)** Oliver: $A = (y - 4) \div 2$: $A = (14 - 4) \div 2$: $A = (10) \div 2$: $A = 5$ years

Shane: $A = [(y - 4) \div 2] + 2$: $A = [(14 - 4) \div 2] + 2$: $A = 5 + 2$: $A = 7$ years

**15. (a)** **(i)** (2, 4) (2, 6), (2, 8) (2, 10) Not a Function

Reason: The first elements of the couples are repeated.

**(ii)** (1, 4) (2, 6), (3, 8) (4, 10) Function

Reason: No first element of the couples is repeated.

**(iii)** (1, 4) (2, 4), (3, 4) (4, 4) Function

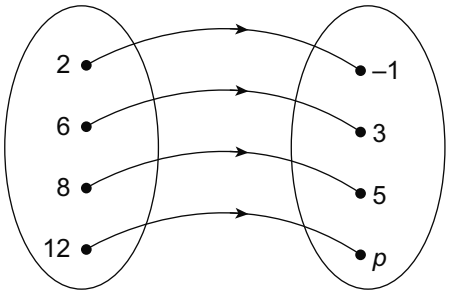
Reason: No first element of the couples is repeated.

**(b)** Domain: {1, 2, 3, 4, 5}

Range: {2, 3, 4, 5, 6}

**(c)** If you add 1 to each element in the domain you get the corresponding element in the range.

**(d)**




Couples: (2, −1) (6, 3) (8, 5) (12, $p$).

**(e)** $p = 12 - 3 = 9$

# Educate.ie Sample 3

# Paper 1

**1.** **(a)** 0·224 0·24 0·244 0·245 0·254 0·42

**(b)** **(i)** $\frac{2}{3}(250) = €166{\cdot}67$

**(ii)** $250 \times 0{\cdot}15 = €37{\cdot}50$
$250 - 37{\cdot}50 = €212{\cdot}50$ ← 15% = 15 ÷ 100 = 0·15

**(iii)** $250 \times 0{\cdot}23 = €57{\cdot}50$
$250 - 57{\cdot}50 = €192{\cdot}50$ ← 23% = 23 ÷ 100 = 0·23

**2.** **(a)** $5{:}4 = \frac{5}{9}$ and $\frac{4}{9}$

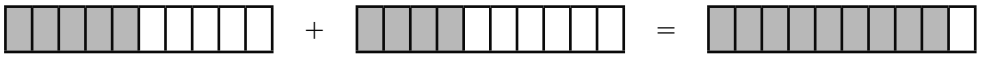
$\frac{5}{9}$ of €3600 = €2000 ← (€3600 ÷ 9) × 5 = €2000

$\frac{4}{9}$ of €3600 = €1600 ← (€3600 ÷ 9) × 4 = €1600

**(b)** $\frac{a^2 \times a^8}{a^3 \times a^7} = \frac{a^{10}}{a^{10}} = 1$ ← Add indices for multiplication.

**3.** **(a)**

| Shape | Shape 1 | Shape 2 | Shape 3 | Shape 4 |
|---|---|---|---|---|
| Fraction | $\frac{2}{9}$ | $\frac{3}{7}$ | $\frac{320}{360} = \frac{8}{9}$ | $\frac{3}{9} = \frac{1}{3}$ |

**(b)** 

5 parts $\left(\frac{5}{10}\right)$ + 4 parts $\left(\frac{4}{10}\right)$ = 9 parts $\left(\frac{9}{10}\right) = 0{\cdot}9$

**(c)** $\frac{1}{2} + \frac{2}{5} = 0{\cdot}5 + 0{\cdot}4 = 0{\cdot}9$

**4.**

| Region | $A \cap B$ | $A \cup B$ | $B \setminus A$ | $A \setminus B$ | $A^c$ | $(A \cap B)^c$ |
|---|---|---|---|---|---|---|
| Diagram no. | 2 | 1 | 4 | 3 | 6 | 5 |

This is the complement of A i.e. the elements outside A.

**5.** **(a)** 20% of €530 = €106

€106 − €31·70 = €74·30

**(b)** 4% of €530 = €21·20 PRSI

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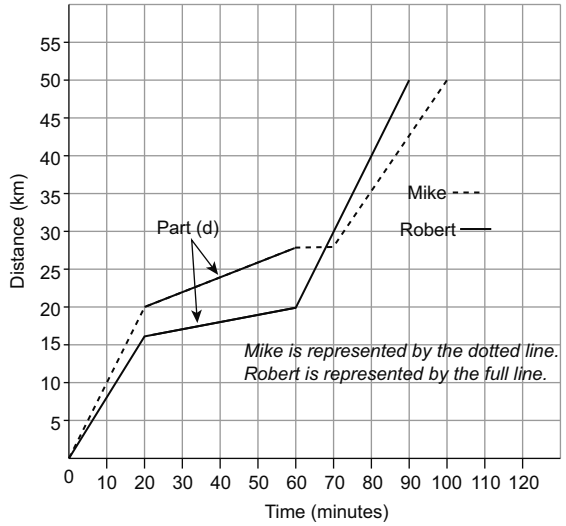
**(c)**

| Carmel's payslip | |
|---|---|
| **Gross pay** | **Deductions** |
| **€530** | **Net tax** €74·30 |
| | **PRSI** €21·20 |
| | **USC** €24 |
| | **Total deductions** €119·50 |
| | **Net pay = Gross pay – Total deductions**<br>**Net pay =** €530 − €119·50 = €410·50 |

**6.**




**(a)** Mike

**(b)** Mike: He stopped for 10 minutes.

**(c)** Robert

**(d)** See arrows on graph.

**(e)** $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$

$\text{Speed} = \dfrac{30 \text{ km}}{30 \text{ min}}$ ← 30 mins = 0·5 hours. 30 ÷ 0·5 = 60 km/hr. Be sure to include units in your answer.

$= 60$ km/h

**7. (a)**

| Rate | Number of Years: One | Two | Three |
|---|---|---|---|
| 1% | €1·01 | €1·02 | €1·03 |
| 1·5% | €1·02 | €1·03 | €1·05 |
| 2% | €1·02 | €1·04 | €1·06 |
| 2·5% | €1·03 | €1·05 | €1·08 |
| 3% | €1·03 | €1·06 | €1·09 |
| 3.5% | €1·04 | €1·07 | €1·11 |
| 4% | €1·04 | €1·08 | €1·12 |

$1{\cdot}11 \times 10\,000 = €11\,100$

**(b)**

| Rate | Number of Years: One | Two | Three |
|---|---|---|---|
| 1% | €1·01 | €1·02 | €1·03 |
| 1·5% | €1·02 | €1·03 | €1·05 |
| 2% | €1·02 | €1·04 | €1·06 |
| 2·5% | €1·03 | €1·05 | €1·08 |
| 3% | €1·03 | €1·06 | €1·09 |
| 3·5% | €1·04 | €1·07 | €1·11 |
| 4% | €1·04 | €1·08 | €1·12 |

$1{\cdot}04 \times 20\,000 = €20\,800$

Interest = €800 ← Interest = Total Amount − Principal

**(c)** €1 = €1·09 ← Unitary Method

$€x = €16\,350$

$$x = \frac{16\,350}{1{\cdot}09} = €15\,000$$

**8. (a) (i)** $y^2 - 5y$

$y(y - 5)$ ← Common factor: $y$ is common.

**(ii)** $y(y - 5) = 0 \quad \Rightarrow y = 0$ or $y = 5$

**(b) (i)** $y^2 - 2y - 8$

$(y - 4)(y + 2)$ ← Quadratic factors

**(ii)** $(y - 4)(y + 2) = 0 \quad \Rightarrow y = 4$ or $y = -2$

**(c)** **(i)** $y^2 - 9$

$(y + 3)(y - 3)$ ← Difference of two squares

**(ii)** $(y + 3)(y - 3) = 0 \quad \Rightarrow y = -3$ or $y = 3$

**9. (a)** **(i)** $k_1 \quad y = x + 3$

$k_2 \quad y = -x + 1$

**(ii)** The co-ordinates of $B$. $(-1, 2)$

**(b)** $y = x + 3$

$y = -x + 1$

$\Rightarrow x + 3 = -x + 1$

$\therefore 2x = -2$

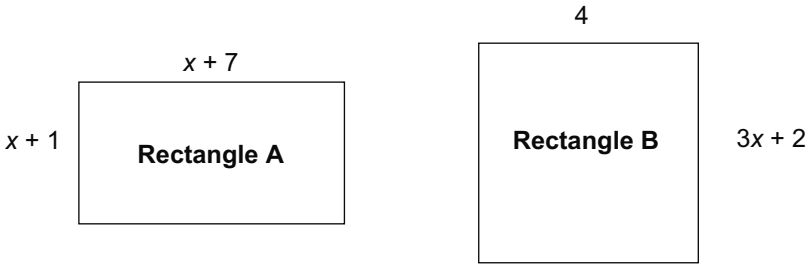
$x = -1$

$y = -1 + 3$

$y = 2$

Co-ordinates of $B$ are $(-1, 2)$

**10.**




$2(x + 7 + x + 1) = 2(4 + 3x + 2)$

$2x + 8 = 3x + 6$

$x = 2$

**11. (a)**

| Week | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2012** | €3·00 | €3·20 | €3·40 | €3·60 | €3·80 | €4·00 | €4·20 | €4·40 | €4·60 | €4·80 | €5·00 |
| **2013** | €3·50 | €3·40 | €3·30 | €3·20 | €3·10 | €3·00 | €2·90 | €2·80 | €2·70 | €2·60 | €2·50 |

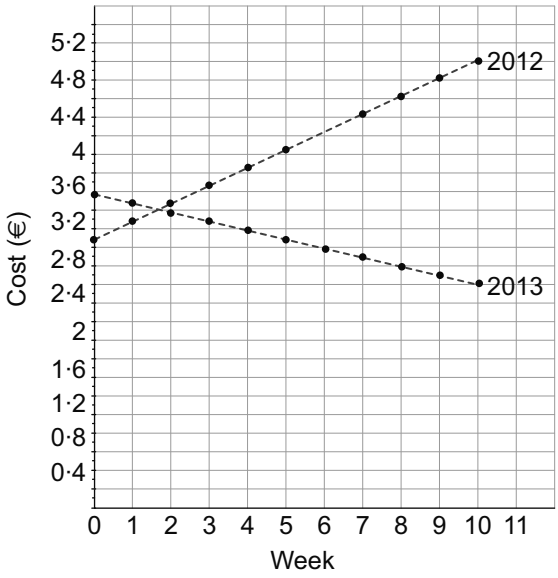
Add €0·20 each time.

Subtract €0·10 each time.

**(b)** €5·00

**(c)** Cost equals the week number by 20 cent plus three euro.

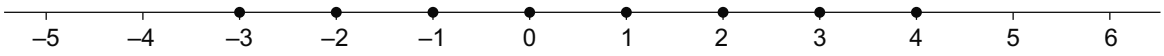
**(d)**




**(e)** €2·50

**12. (a)**

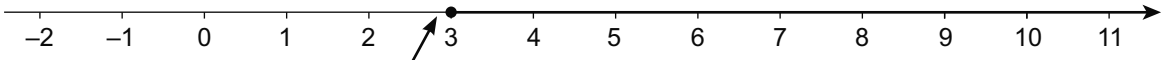

**(b)**




**(c)** $3x - 5 \geq 4$

$3x \geq 9$

$x \geq 3$




3 is included in the answer.

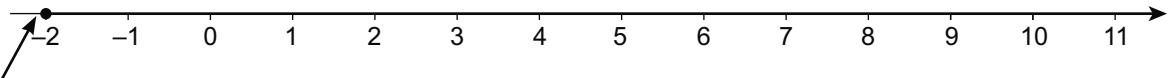
**(d)** $2(-x - 5) \leq -6$

$-2x - 10 \leq -6$

$-2x \leq 4$

$2x \geq -4$

$x \geq -2$




−2 is included in the answer.

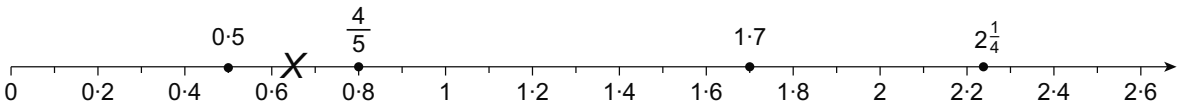
**13. (a)**

| Graph | Function |
|---|---|
| **Graph A** | **5** |
| **Graph B** | **4** |
| **Graph C** | **6** |
| **Graph D** | **3** |
| **Graph E** | **2** |
| **Graph F** | **1** |

# Educate.ie Sample 4

# Paper 1

**1.** **(a)**




**(b)** Shown on number line above.

$2\frac{1}{4} - \frac{4}{5} \div 0{\cdot}5 = 0{\cdot}65$

When working this out be careful of the order of operations (BIMDAS).

**2.** €810 = 90% €900 = 112·5%

€9 = 1% Séan sold the computer for €900. €8 = 1%

€900 = 100% Séan bought the computer for €800. €800 = 100%

**3.** **(a)** **(i)** $\{1, 2, 3\} \subset \{1, 2, 3\}$ True

**(ii)** # of $\{1, 2, 3\} = 2$ False

**(iii)** $4 \in \{1, 2, 3\}$ False

**(iv)** $\{1, 2, 3\} = \{3, 2, 1\}$ True

**(v)** $\emptyset \subset \{1, 2, 3\}$ True

**(b)** $\{\ \}, \{0\}, \{3\}, \{6\}, \{0, 3\}, \{0, 6\}, \{3, 6\}, \{0, 3, 6\}$

The null set

**(c)** **(i)** $\{1, 2, 3, 4, 6, 12\}$

**(ii)** $\{2, 3, 5, 7\}$

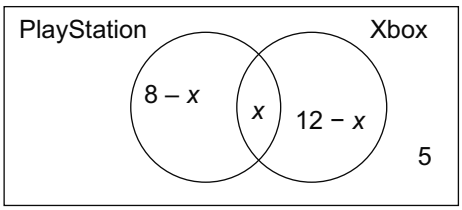
**(iii)** $\{3, 4, 5, 6\}$

**(iv)** $\{-2, -1, 0, 1, 2, 3\}$

**4.** **(a)**

| | **PlayStation** | **Xbox** | **Neither** |
|---|---|---|---|
| **Female** | 8 | 12 | 5 |
| **Male** | 10 | 15 | 3 |
| **Total** | 18 | 27 | 8 |

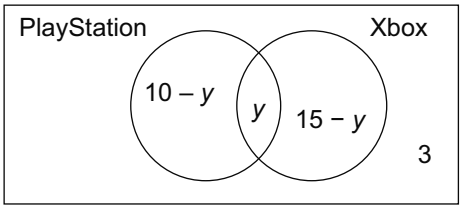
**(b)** **(i)**




$8 - x + x + 12 - x + 5 = 23$

$25 - x = 23 \qquad x = 2$

**(ii)**




$10 - y + y + 15 - y + 3 = 22$

$28 - y = 22 \qquad y = 6$

**(iii)** $2 + 6 = 8$

**5.**

| **Loan** | €5000 |
|---|---|
| Interest for 1st year | €200 |
| Repayment | €1000 |
| **Loan** | €4200 |
| Interest for 2nd year | €168 |
| Repayment | €2000 |
| **Loan** | €2368 |
| Interest for 3rd year | €94·72 |
| Balance to be paid | €2462·72 |

**6.**

| **Story** | **A** | **B** | **C** | **D** | **E** | **F** |
|---|---|---|---|---|---|---|
| **Graph** | 4 | 6 | 1 | 2 | 5 | 3 |

**7.** Two years ago: $3x + 9y = 120$

Last year: $5x + 5y = 90$

$15x + 45y = 600$

$15x + 15y = 270$

$30y = 330 \qquad \Rightarrow y = 11$

$3x + 99 = 120$

$3x = 21 \qquad \Rightarrow x = 7$

$5x + 7y$

$5(7) + 7(11)$

This year: $35 + 77$

112 minutes

**8.** **(a)** **(i)** $12x^2 + 6x$ ← Multiply both terms in brackets by 6.

**(ii)** $12x^2 + 6x$

$12(-2)^2 + 6(-2)$ ← Use brackets to help in substitution.

$12(4) - 12$

$48 - 12$

$36$

**(b)** $x^2 - 9$ ← Difference of two squares

$(x + 3)(x - 3)$

**(c)** $x^2 + 2x - 35$ ← Quadratic factors

$(x + 7)(x - 5)$

**(d)** $x^3 + 5x^2 - 6x$ ← Common factor $x$

$x(x^2 + 5x - 6)$ ← Quadratic factors also

$x(x + 6)(x - 1)$

**9.** **(a)** $3{\cdot}4 \times 10^7 - 3{\cdot}1 \times 10^7 = 3{\cdot}0 \times 10^6$ metres ← Calculator: Remember units.

**(b)** $3{\cdot}4 \times 10^7 + 3{\cdot}1 \times 10^7 + 6{\cdot}4 \times 10^6 = 7{\cdot}78 \times 10^7$ metres ← Calculator: Remember units.

**10.** **(a)** **(i)** D

**(ii)** E

**(iii)** C (Accept E also)

**(iv)** F

**(v)** A

**(vi)** B

**(b)** $A = (2, 0)$ $B = (-2, 0)$ $C = (0, -4)$

**11.** **(a)** $a = \dfrac{2b + c}{5}$

$a = \dfrac{2(12{\cdot}5) + 2\frac{3}{4}}{5}$

$a = 5{\cdot}55$

**(b)** $a = \dfrac{2b + c}{5}$

$5a = 2b + c$

$5a - c = 2b$

$\frac{5a - c}{2} = b$

$b = \frac{5a - c}{2}$

**12. (a) Method 1**

| | $3x$ | $2$ |
|---|---|---|
| $2x$ | $6x^2$ | $4x$ |
| $1$ | $3x$ | $2$ |

$3x + 2$

**Method 2**

$$2x + 1 \overline{)\,6x^2 + 7x + 2}$$

$3x + 2$

$6x^2 + 3x$

$4x + 2$

$4x + 2$

**(b)**

| | $x$ | $4$ |
|---|---|---|
| $x$ | $x^2$ | $4x$ |
| $2$ | $2x$ | $8$ |

Perimeter $= 2(x + 4 + x + 2) = 2(2x + 6) = 4x + 12$

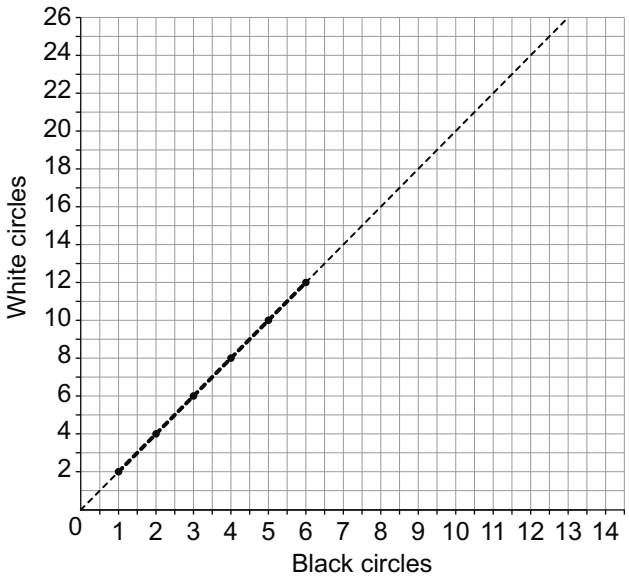
**13. (a)** 5

**(b)**

| Pattern | Black circles | White circles |
|---|---|---|
| 1 | 1 | 2 |
| 2 | 2 | 4 |
| 3 | 3 | 6 |
| 4 | 4 | 8 |
| 5 | 5 | 10 |
| 6 | 6 | 12 |
| 7 | 7 | 14 |

**(c)** The number of white circles is always double the number of black circles in each pattern.

**(d)**

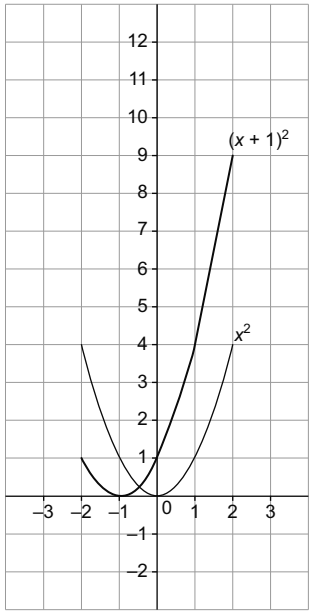



**(e)** 12

**(f)** $2n$

**14. (a)**

| $x$ | $x^2$ | $(x+1)^2$ |
|---|---|---|
| –2 | $(-2)^2 = 4$ | $(-2+1)^2 = 1$ |
| –1 | $(-1)^2 = 1$ | $(-1+1)^2 = 0$ |
| 0 | $(0)^2 = 0$ | $(0+1)^2 = 1$ |
| 1 | $(1)^2 = 1$ | $(1+1)^2 = 4$ |
| 2 | $(2)^2 = 4$ | $(2+1)^2 = 9$ |




**(b)** You would have to move $g$ one place to the right (positive direction) along the $x$ axis so that it lies exactly on the graph of $f$.

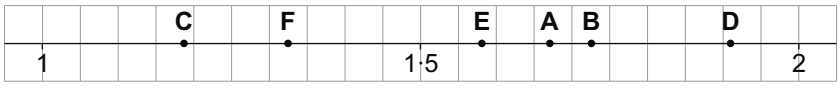
# Educate.ie Sample 5

# Paper 1

**1. (a)**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **Number** | $1\cdot\dot{6}$ | $2 \sin 60^o$ | $\frac{43}{36}$ | $\sqrt[3]{7}$ | $\frac{\pi}{2}$ | $(1 + 0\cdot1)^3$ |
| **Decimal number** | 1·67 | 1·73 | 1·19 | 1·91 | 1·57 | 1·33 |

**(b)**




**2. (a)**

| **Expression** | $2n$ | $n^2$ | $3n$ | $2n + 1$ | $3(n - 1)$ | $(n - 1)(n + 1)$ |
|---|---|---|---|---|---|---|
| **Odd or even?** | Even | Odd | Odd | Odd | Even | Even |

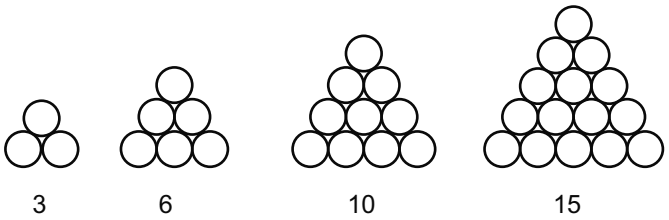
**(b)** $(n + 1) + 2$ is odd because if $n$ is even we are adding 1 to it to make an odd number. Then if we add 2 to this odd number it will also be odd.

**3. (a)** **(i)** 3, 6, 9, 12, 15, 18, ← Add 3 each time

**(ii)** 9, 5, 1, −3, −7, −11, ← Add −4 each time

**(iii)** 1·5, 2, 2·5, 3, 3·5, 4, ← Add 0·5 each time

**(b)**



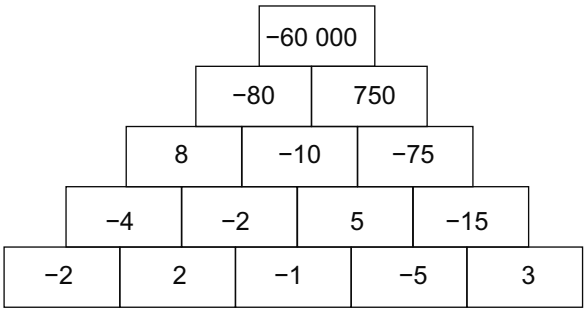

21, 28

$(3 + 3) = 6$, $(6 + 4) = 10$, $(6 + 4 + 5) = 15$,

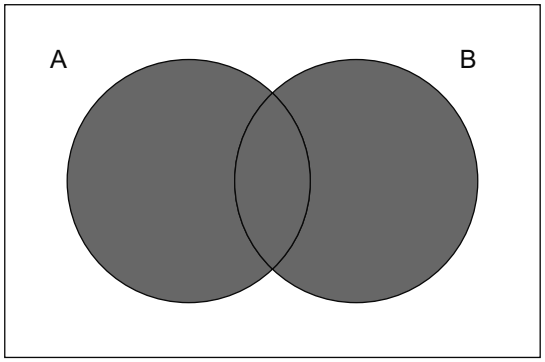
$(6 + 4 + 5 + 6) = 21$, $(6 + 4 + 5 + 6 + 7) = 28$

Sample 5
Educate.ie P1

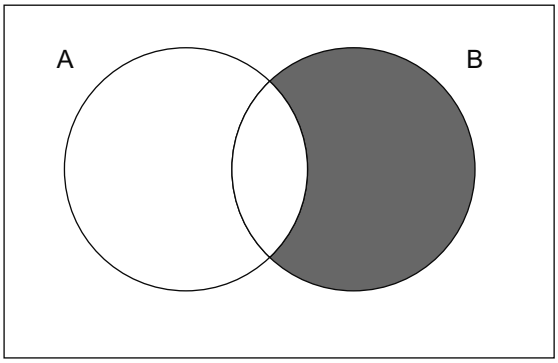
**(c)**



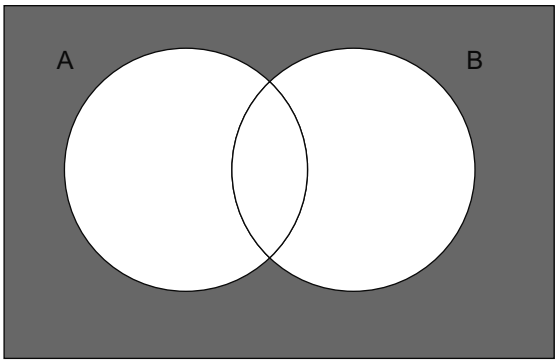

**4.** **(a)**




**(b)**




**(c)**




**(d)** **(i)** 4

**(ii)** 4

**(iii)** $\{2, 3\}$

**5.** **(a)** $\dfrac{a^2 - b^2}{a + b} = \dfrac{(a + b)(a - b)}{a + b} = a - b$ ← Factors: Difference of two squares

**(b)** $\dfrac{a^4b^3}{(ab)^2} = \dfrac{a^4b^3}{a^2b^2} = a^2b$ ← Simplify brackets

**(c)** $\dfrac{a^3b^2 - b^3a^2}{a^2 - ab} = \dfrac{a^2b^2(a-b)}{a(a-b)} = \dfrac{a^2b^2}{a} = ab^2$ ← Factorise: Common factor

**6. (a)** $\frac{1}{4}$ of 36 = 9

**(b)** $\frac{3}{10}$ of 30 = 9

**(c)** 9 + 9 = 18, do not watch *The Voice*

66 – 18 = 48 watch *The Voice*

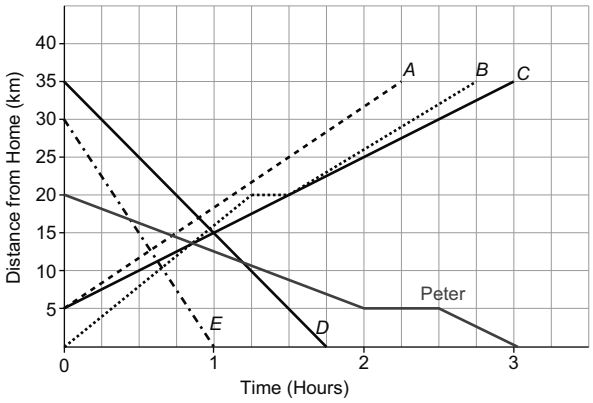
$\dfrac{48}{66} \times \dfrac{100}{1} = 72{\cdot}7\%$

**(d)** Ratio: 21 in Brían 27 in Áine = 21:27 = 7:9

**7. (a)**

| | **Jack** | **James** | **Daniel** | **Seán** | **Conor** |
|---|---|---|---|---|---|
| **Graph number** | C | B | E | D | A |

**(b)**




**(i)** Sketch of Peter's journey is on the diagram above.

**(ii)** 3 hours

**8.**

| | **A** | **B** | **C** | **D** | **E** | **F** |
|---|---|---|---|---|---|---|
| $x = y$ | | ✓ | | | | ✓ |
| $x \geq y$ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| $x = 0$ | | | ✓ | | | |
| $x \leq y$ | ✓ | ✓ | | | | ✓ |
| $y \geq 0$ | ✓ | | | | ✓ | ✓ |
| $x + y < 0$ | ✓ | ✓ | ✓ | ✓ | | |

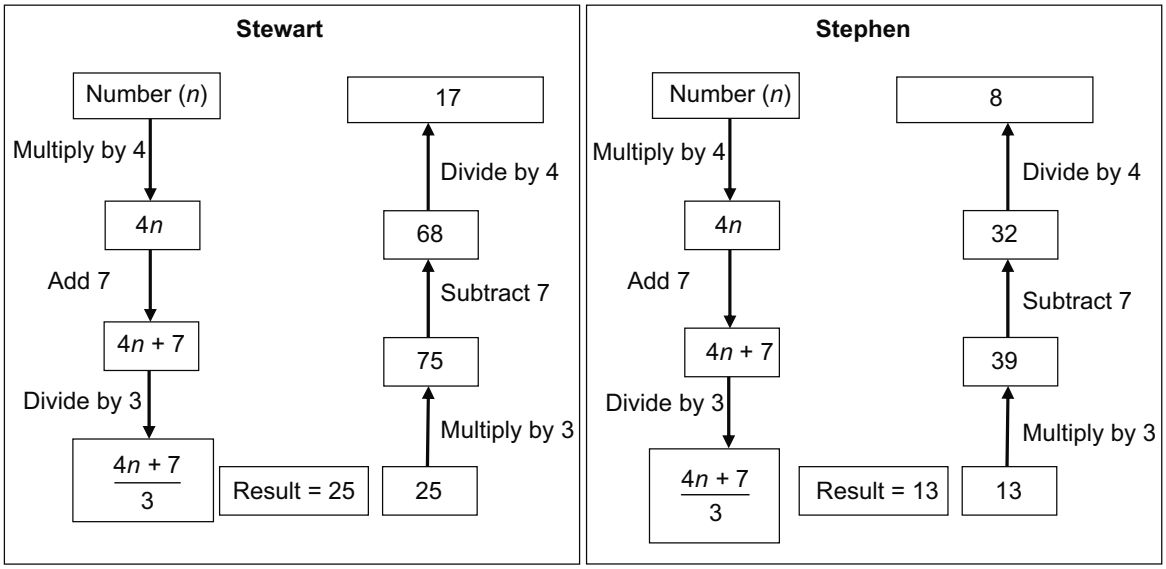
**9.** **(a)** $3^7$

**(b)** $\frac{1}{2}$

**(c)** 8

**(d)** 9

**10.** **(a)**




**(b)** $\frac{4n+7}{3} = 25$

$4n + 7 = 75$

$4n = 68$

$n = 17$

**(c)** $\frac{4(17)+7}{3} = 25 \quad \Rightarrow \frac{75}{3} = 25 \quad \therefore$ The solution is true.

**11.** **(a)** **(i)** $x^2 - 4x - 21$

$(x - 7)(x + 3)$ ← Quadratic factors

**(ii)** $(x - 7)(x + 3) = 0$

$x = 7 \quad$ or $\quad x = -3$

**(b)** **(i)** $x^2 - 12x + 36$

$(x - 6)(x - 6)$ ← Quadratic factors

**(ii)** $(x - 6)(x - 6) = 0$

$x = 6 \quad$ or $\quad x = 6$

**12. (a)** $T = 26 - \frac{8000}{150}$

$T = -27{\cdot}33°\text{C}$

**(b)** $-50 = 26 - \frac{h}{150}$

$\frac{h}{150} = 26 + 50$

$\frac{h}{150} = 76$

$h = 11\ 400$ m

**13. (a)**

| Time | Air temperature (C°) |
|---|---|
| Midnight | 4 C° |
| 1 am | 0 C° |
| 2 am | −2 C° |
| 3 am | −2 C° |
| 4 am | 0 C° |
| 5 am | 4 C° |

**(b)** Answer: Yes, the graph is quadratic.

Reason: The second differences are constant.

**(c)** −2·25 C°

**(d)** 0:45 am and 4:15 am

# Educate.ie Sample 6

# Paper 1

**1.** **(a)** **(i)** 30 m = 3000 cm

**(ii)** 3 km = 3000 m = 300 000 cm

**(iii)** 45 mm = 4·5 cm

1 cm = 10 mm
1 m = 100 cm
1 km = 1000 m

**(b)** 50 000 × 5 = 250 000 cm = 2500 m = 2·5 km

**2.** **(a)** $2\frac{1}{4}$

**(b)** $3\frac{1}{2} + 5\frac{1}{4} = 8{\cdot}75$

$8{\cdot}75 \div 2 = 4{\cdot}375$ or $4\frac{3}{8}$

**(c)** $(2{\cdot}12 + 3\frac{2}{5}) \div \frac{3}{5} + 3$

Remember the order of operation BIMDAS.

$(5{\cdot}52) \div \frac{3}{5} + 3$

$9{\cdot}2 + 3$

$12{\cdot}2$

**3.** **(a)** $x + y + z = 18$

$x + y = z$

$\Rightarrow z + z = 18$

$\therefore z = 9$

**(b)** $a + b = 12$

$b$ is twice $a$.

$\Rightarrow a + 2a = 12$

$3a = 12$

$a = 4 \qquad \therefore b = 8$

**(c)** $w - t = 5$

$w$ is 3 times the value of $t$.

$\Rightarrow 3t = w$

$\therefore 3t - t = 5$

$2t = 5 \qquad \Rightarrow t = 2{\cdot}5$

$w = 3(2{\cdot}5) = 7{\cdot}5$

**4.** Kevin: 5% of €56·25 = €2·81 Mary: 7·5% of €125·74 = €9·43

5% of €56·25 = €56·25 × 0·05 = €2·81

€56·25 − €2·81 = €53·44 €125·74 − €9·43 = €116·31

**5.** **(a)** 23 ∈ A True

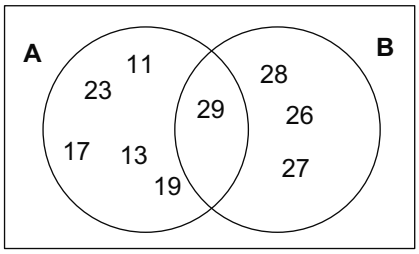
**(b)** 25 ∈ B False

**(c)** # B = 10 False

**(d)** A ∩ B {29} True

**(e)** # (B/A) = 3 True

**(f)** 5 ∉ A True




**6.** **(a)** 20% of €432 = €86·40

20% of €432 = €432 × 0·2 = €86·40

€86·40 − €60 = €26·40

Net tax = €26·40

**(b)** 2% of €193 = €3·86

2% of €193 = €193 × 0·02 = €3·86

4% of €115 = €4·60

7% of €124 = €8·68

Total USC = €17·14

**(c)** 4% of €432 = €17·28

4% of €432 = €432 × 0·04 = €17·28

Total PRSI = €17·28

**(d)** €432 – (€26·40 + €17·14 + €17·28)

Net wage = €371·18

Sample 6
Educate.ie P1

**7. (a)**

| | | |
|---|---|---|
| **Billing period** | | |
| 24 April 14 to 22 June 14 (2 months) (60 days) | | |
| **Meter reading** | | |
| 945 units @ 16·17 cent per unit | €152·81 | ← €0·1617 × 945 = €152·81 |
| 164 units @ 15·23 cent per unit | €24·98 | ← €0·1523 × 164 = €24·98 |
| **Standing charge** | | |
| €160 per year | €26·67 | ← €160 ÷ 6 = €26·67 |
| **PSO levy** | | |
| €27·84 per year | €4·64 | ← €27·84 ÷ 6 = €4·64 |
| **Subtotal** | €209·10 | |
| **VAT @ 13·5% of subtotal** | €28·23 | ← €209·10 × 0·135 = €28·23 |
| **Total** | €237·33 | |

**(b)** €237·33 ÷ 60 = €3·96

**8. (a)** **(i)** $3 \times 10^{-4}$ **(ii)** $2 \times 10^{-7}$ **(iii)** $3 \times 10^{5}$ **(iv)** $3{\cdot}25 \times 10^{8}$

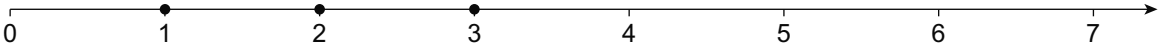
**(b)** **(i)** 350 000 **(ii)** 2400 **(iii)** 0·00055 **(iv)** 0·03

**9. (a)** $4x - 3 < 17$

$4x < 20 \quad \Rightarrow x < 5$


**(b)** $7x \leq 2x + 15$

$5x \leq 15 \quad \Rightarrow x \leq 3$

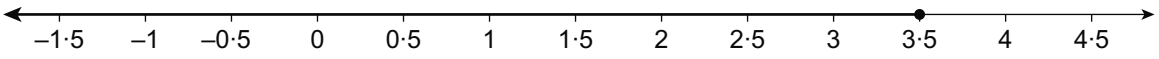



**(c)** $3x - 2 \geq 5x - 9$

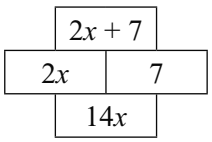
$-2x \geq -7$

$2x \leq 7$

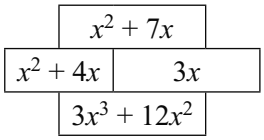
$x \leq 3{\cdot}5$



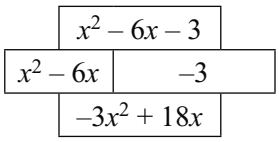
**10. (a)**



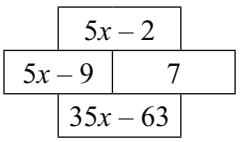

**(b)**



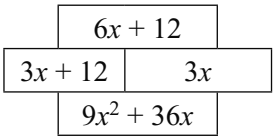

**(c)**



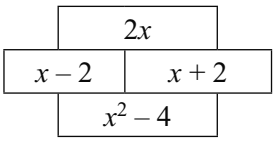

**(d)**




**(e)**




**(f)**




**11.**

| Statement | Sequence | Next three terms of the sequence |
|---|---|---|
| 1 | D | 2, 4, 8, 16, 32, 64, 128 |
| 2 | E | 3, 8, 13, 18, 23, 28, 33 |
| 3 | A | 7, 5, 3, 1, −1, −3, −5 |
| 4 | C | 1, 8, 27, 64, 125, 216, 343 |
| 5 | B | 100, 10, 1, 0·1, 0·01, 0·001, 0·0001 |

**12. (a)** $(2x + 3)(3x) + \frac{1}{2}(2x)(4x) = 9$

**(b)** $(2x + 3)(3x) + \frac{1}{2}(2x)(4x) = 9$

$6x^2 + 9x + 4x^2 = 9$

$10x^2 + 9x - 9 = 0$

$(5x - 3)(2x + 3) = 0$

$x = \frac{3}{5} = 0{\cdot}6 \text{ cm} = 6 \text{ mm}$

**(c)** Area of rectangle $= (2x + 3)(3x) = 6x^2 + 9x$

When $x = 0{\cdot}6$ cm

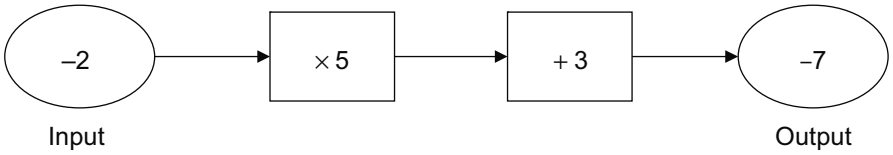
Area of rectangle $= 6(0{\cdot}6)^2 + 9(0{\cdot}6)$

Area of rectangle $= 6(0{\cdot}6)^2 + 9(0{\cdot}6) = 7{\cdot}56 \text{ cm}^2$

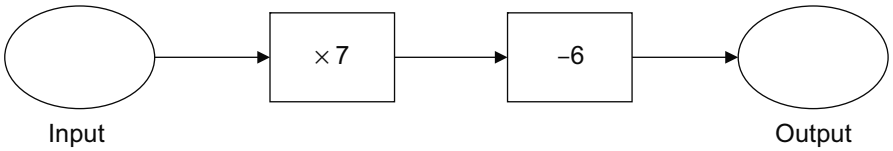
**(d)** $(2x + 3)(3x) + (x)(4x) = 9 \quad \Rightarrow \quad 7{\cdot}56 + (0{\cdot}6)(4)(0{\cdot}6) = 9$

$7{\cdot}56 + 1{\cdot}44 = 9$ This is true.

**13. (a)**

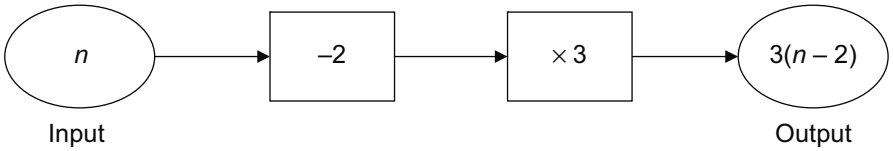


**(b)**




$$7x - 6 = x$$
$$6x = 6$$
$$x = 1$$

**(c)**




**(d)** Couples: (1, −3) (2, 0) (3, 3) (4, 6) (5, 9)

# Educate.ie Sample 7

# Paper 1

**1.** **(a)** $\dfrac{\boxed{4} \times \boxed{5}}{\boxed{4}} = \dfrac{\boxed{20}}{\boxed{4}} = \boxed{5}$

**(b)** 4·53

**2.** **(a)** **(i)** {a, i, e, m, x, s, t, w}

**(ii)** {c}

**(iii)** {s, t, w}

**(b)** **(i)** 2

**(ii)** 3

**(iii)** 9

**3.**

| Year | Interest @ 1% | Interest @ 2% |
|---|---|---|
| Year 1 | €100 | €200 |
| Year 2 | €101 | €204 |
| Year 3 | €102·01 | €208·08 |
| Year 4 | | €212·24 |
| Year 5 | | €216·49 |
| Total interest | €303·01 | €1040·81 |
| Total interest + €10 000 | €10 303·01 | €11 040·81 |
| Monthly repayment | €286·19 | €184·01 |

**(a)** €100 + €101 + €102·01 = €303·01

**(b)** €200 + €204 + €208·08 + €212·24 + €216·49 = €1040·81

**(c)** €10 303·01 ÷ 36 = €286·19

**(d)** €11 040·81 ÷ 60 = €184·01

**4.** **(a)** \$1:€0·75 = €4000:€$x$ ← Use ratio for exchange rate questions.

$\dfrac{1}{0{\cdot}75} = \dfrac{4000}{x}$

$\Rightarrow x = 4000(0{\cdot}75) = €3000$

**(b)** €1:£0·86 = €$x$:£550

$$\frac{1}{0{\cdot}86} = \frac{x}{550}$$

$$\Rightarrow x(0{\cdot}86) = 550(1)$$

$$x = \frac{550}{0{\cdot}86} = €639{\cdot}53$$

**(c)** \$1:€0·75 = \$$x$:€1

$$\frac{1}{0{\cdot}75} = x \Rightarrow x = \$1{\cdot}3$$

€1 = \$1·3 and €1 = £0·86

$\therefore$ \$1·3 = £0·86

\$1·3:£0·86 = \$1:£$x$

$$\Rightarrow \frac{1{\cdot}3}{0{\cdot}86} = \frac{1}{x}$$

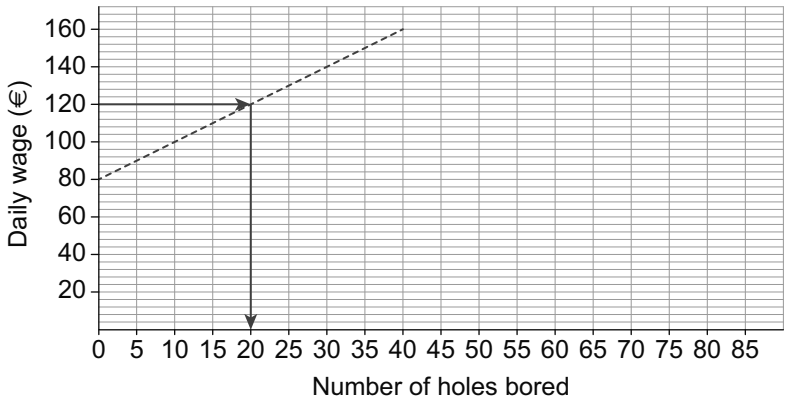
$$\Rightarrow x = \frac{0{\cdot}86}{1{\cdot}3} = 0{\cdot}645$$

$\therefore$ Exchange rate is \$1 = £0·645

**5. (a)**

| **No. of holes ($h$)** | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
|---|---|---|---|---|---|---|---|
| **Daily wage ($P$)** | 80 | 90 | 100 | 110 | 120 | 130 | 140 |

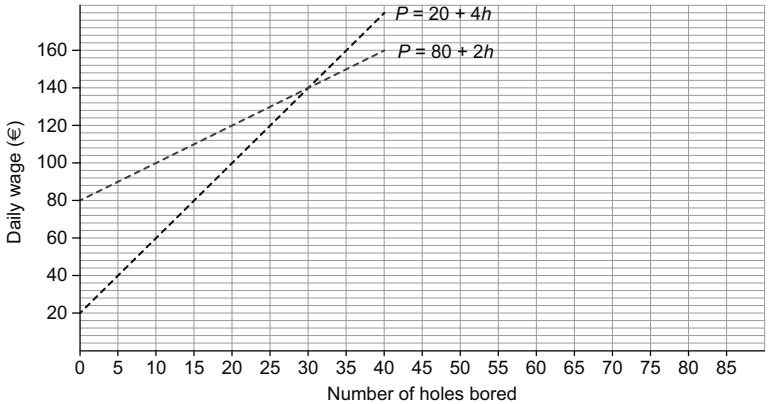
**(b)**




**(c)** 20 holes

**(d)** The slope of the line is 4 and this is the number of euro Séan gets for boring a hole.

**(e)**




30 holes

**(f)** $80 + 2h > 20 + 4h$

$60 > 2h$

$h < 30$

This means that he must bore more than 30 holes in order to earn more.

**6. (a)** $(x^2 + 2x)(x - 3) = x^3 - 3x^2 + 2x^2 - 6x$

$= x^3 - x^2 - 6x$

OR

| | $x^2$ | $2x$ |
|---|---|---|
| $x$ | $x^3$ | $2x^2$ |
| $-3$ | $-3x^2$ | $-6x$ |

Total area = $x^3 - x^2 - 6x$

**(b)**

$$x - 5 \overline{)\, 3x^2 - 19x + 20}$$

$3x - 4$

$3x^2 - 15x$

$-4x + 20$

$-4x + 20$

OR

| | $3x$ | $-4$ |
|---|---|---|
| $x$ | $3x^2$ | $-4x$ |
| $-5$ | $-15x$ | $20$ |

**7. (a)** $4x + 3y^3$

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

$-8 - 81$

$-89$

**(b)** $4x + 3y^3 = z$

$4x = z - 3y^3$

$x = \dfrac{z - 3y^3}{4}$

$z = -2$ and $y = z^2 \Rightarrow y = (-2)^2 = 4$

$x = \dfrac{(-2) - 3(4)^3}{4}$

$x = \dfrac{-2 - 192}{4}$

$x = -48{\cdot}5$

**8.**

| Student | Card number | Statement and question | |
|---|---|---|---|
| 1st Student reads | 1 | I have $x$. | Who has three times this? |
| 2nd Student replies | 5 | I have $3x$. | Who has this plus 5? |
| 3rd Student replies | 8 | I have $3x + 5$. | Who has this divided by 2? |
| 4th Student replies | 7 | I have $\frac{3x+5}{2}$. | Who has this minus 4? |
| 5th Student replies | 2 | I have $\frac{3x+5}{2} - 4$. | Who has this as a single fraction? |
| 6th Student replies | 6 | I have $\frac{3x-3}{2}$. | Who has this multiplied by 2? |
| 7th Student replies | 9 | I have $3x - 3$. | Who has this written as the product of two factors? |
| 8th Student replies | 4 | I have $3(x - 1)$. | Who has this divided by 3? |
| 9th Student replies | 3 | I have $x - 1$. | Who has this plus 1? |
| 10th Student replies | 1 | I have $x$. | Who has three times this? |

**9.**

| Section of graph | Description |
|---|---|
| Start to $A$ | The climb starts and Nancy climbs for the first 400 m at a steady pace. She climbs this part in 50 minutes which is a speed of 8 m/minute. |
| $A$ to $B$ | Nancy slows down between 400 m and 440 m. Her speed in this part is 40 m divided by 10 minutes which is 4 m/minute. This part of the climb might have been steeper or maybe Nancy was getting tired. |
| $B$ to $C$ | She rests for 10 minutes. |
| $C$ to $D$ | On this part of the climb she goes at a steady pace but her pace is slower than her climb from the start to $A$ as the slope of this line is less than the slope of $AB$. Her speed is distance divided by the time which is 280 m divided by 70 which is 4 m/minute. This is the same speed she was travelling at when going from $A$ to $B$. |
| $D$ to $E$ | This part must have been steeper as she slows down. She reaches the top at $E$. |
| $E$ to $F$ | She begins the descent. She goes at a slow pace from $E$ to $F$. |
| $F$ to $G$ | At $F$ she speeds up and descends at a steady pace. |
| $G$ to $H$ | She stops at $G$ for 10 minutes. |
| $H$ to end | She descends at a rate of approximately 6 m/minute until she reaches the bottom. The total time for her climb was 300 minutes. It took her 160 minutes to get to the top and 140 minutes to descend. She had in total 20 minutes rest during the climb. |

**10. (a)** $(x^2 + x) + (xy + y)$ ← Grouping

$x(x + 1) + y(x + 1)$

$(x + 1)(x + y)$

**(b)** $5x^2 - 20$

$5(x^2 - 4)$ ← Common factor

$5(x + 2)(x - 2)$ ← Difference of two squares

**11. (a)** $\frac{x-3}{2}+\frac{x+2}{5}$

$\frac{5(x-3)+2(x+2)}{10}$

$\frac{5x-15+2x+4}{10}$

$\frac{7x-11}{10}$

**(b)** $\frac{7x-11}{10}=1$

$\Rightarrow 7x-11=10$

$\therefore 7x=21$

$x=3$

**(c)** $\frac{(3)-3}{2}+\frac{(3)+2}{5}=1$

$\Rightarrow \frac{0}{2}+\frac{5}{5}=1$

$\therefore 1=1$

**12. (a)** (3, 2). Reason: This is the only point in the first quadrant.

**(b)** $x-2y+1=0$

$x+3y-9=0$

$-5y+10=0$

$5y=10$

$y=2$

$x-2(2)+1=0$

$x-4+1=0$

$x-3=0$

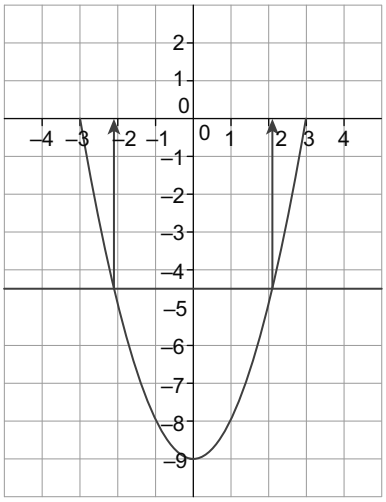
$x=3$

Point is (3, 2)

**13. (a)**

| $x$ | $f(x)$ | $(x,\ f(x))$ |
|---|---|---|
| −3 | 0 | (−3, 0) |
| −2 | −5 | (−2, −5) |
| −1 | −8 | (−1, −8) |
| 0 | −9 | (0, −9) |
| 1 | −8 | (1, −8) |
| 2 | −5 | (2, −5) |
| 3 | 0 | (3, 0) |

**(b)**




**(c)** $x=-2{\cdot}1$ and $x=2{\cdot}1$

# Educate.ie Sample 1
# Paper 2

**1.** **(a)** $6 \times 12 = 72 \text{ m}^2$

Area of garden (rectangle) = Length × Breadth

**(b)** $\pi r^2 \div 2$

$(3{\cdot}14)(6)(6) \div 2 = 56{\cdot}52 \text{ m}^2$

Area of lawn = Area of a semicircle = $\frac{1}{2}\pi r^2$

Area of disc: See page 8 of *Formulae and Tables*.

**(c)** $72 - 56{\cdot}52 = 15{\cdot}48 \text{ m}^2$

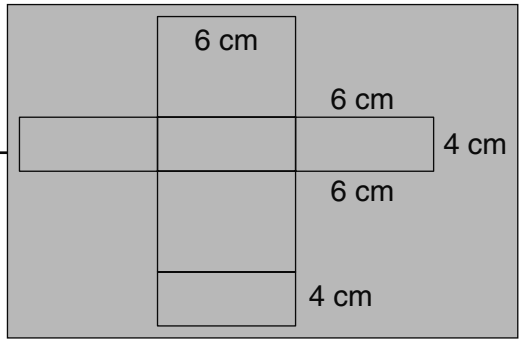
Area of flowerbeds = Area of a Garden – Area of lawn

**2.** **(a)** $2 \times 2 \times 2 = 8 \text{ cm}^3$

Volume of cube = $2^3$: Make sure you put units in the answer.

**(b)** $18 \times 8 = 144 \text{ cm}^3$

**(c)** $2(6 \times 6) + 2(6 \times 4) + 2(6 \times 4)$
$= 72 + 48 + 48$
$= 168 \text{ cm}^2$




**(d)** $168 \times 25 = €4{,}200$

**3.** $820$
$+ 475$
$1295 \div 1000 = 1{\cdot}295 \text{ kg}$

Weight of flour + Weight of sugar
= 820 grams + 475 grams
= 1295 grams
1000 grams = 1 kilogram
1295 grams = 1·295 kilograms

**4.** **(a)** Mode is the number that appears most often = 4.

**(b)** 2 hours

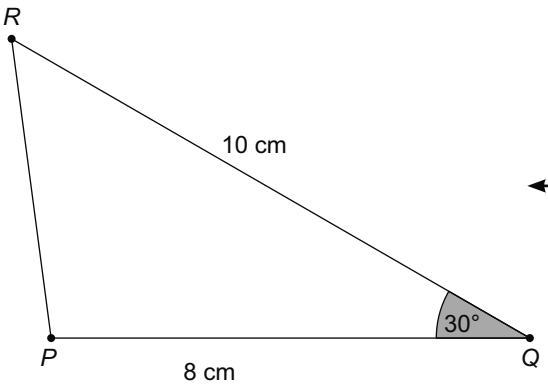
**(c)** Friday

It is the lowest bar. She studied for 1 hour on Friday.

**(d)** Total hours = 2 + 3·5 + 3 + 2·5 + 1
= 12

$\frac{3}{12} \times 100 = 25\%$

**5.**

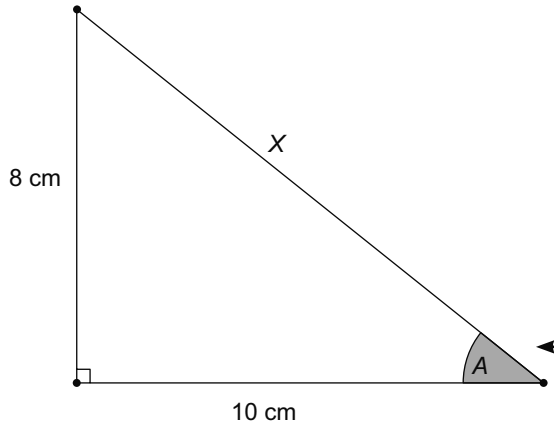



Steps:
1. Draw a line 8 cm in length with a ruler. Label it as *PQ*.
2. With the centre of the protractor on *Q*, mark out an angle of 30°.
3. With a compass, mark off 10 cm along the 30° line. Label the point 10 cm from *Q* as *R*.
4. Join *R* to *P*.

**6.** $4 \times 3 = 12$

This is the Fundamental Principle of Counting. Choosing from 4 and then choosing from 3 gives a total of $4 \times 3$ options.

**7.** **(a)**




Angle of Elevation (looking up)

**(b)** We know the opposite side = 8 and the adjacent = 10.

So we use tan $A$.

Tan of an angle $= \dfrac{\text{Opposite}}{\text{Adjacent}}$

**(c)** Correct to the nearest degree

$\tan A = \dfrac{8}{10} = 0{\cdot}8$

Tan of $A = \dfrac{\text{Opposite}}{\text{Adjacent}} = \dfrac{8}{10} = 0{\cdot}8$

$A = \tan^{-1}(0{\cdot}8)$

$A = 39°$

If you have a Casio Calculator press SHIFT tan then type in 0·8 and press =. This gives an answer of 38·6598 degrees = 39° to the nearest degree.

**(d)** $x^2 = 8^2 + 10^2$

$x = \sqrt{164} = 12{\cdot}8$

Using Pythagoras's Theorem we can find $x$.

**(e)** No, as it is less than 40° and not ideal.

**8.** **(1)** That you will one day die

Any two events that are going to happen

**(2)** That you will drink a liquid within the next week

**9.** **(a)** $\dfrac{5}{12}$

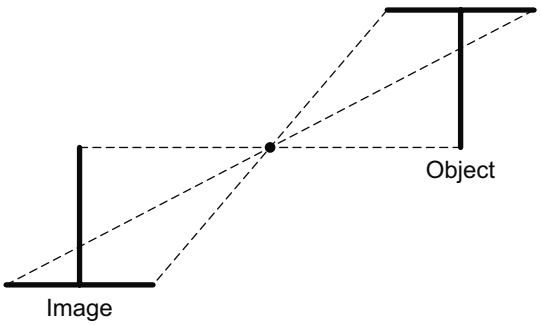
Probability $= \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}}$

**(b)** $\dfrac{2}{12} = \dfrac{1}{6}$

Always write your answer as the smallest fraction.

**(c)** $\dfrac{5}{12}$

**10.** **(a)**



**(b)** The shape is turned upside down and back to front.

**(c)** The lengths, angles and area stay the same in the shape.

**11.** Congruent by SSS ← Side, Side, Side = Side, Side, Side

$|AB| = |AC|$ Both 5

$|AD| = |AD|$ Common side

$|BD| = |DC|$ Both 3

**12.** **(a)** It is a Δ where 2 sides are the same length and the 3rd side is different.

**(b)** $x = 56°$ Isosceles triangle

$y = 180 - 56 - 56$

$y = 68°$ since the 3 angles in a triangle equal 180°.

**13.** $A = 65°$ Corresponding angle

$B = 65°$ Vertically opposite $A$

$C = 140°$ Straight line since $40° + 140° = 180°$

**14.** **(a)** $3x - 4(0) = 12$

$3x = 12$

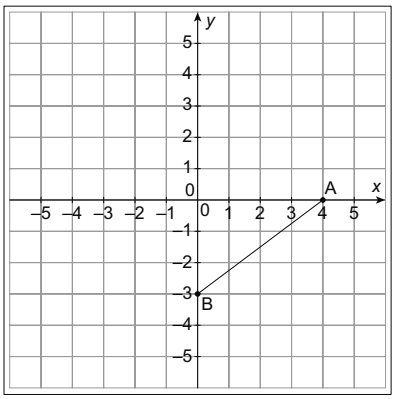
$x = \frac{12}{3} = 4$ (4, 0) = A

**(b)** $3(0) - 4y = 12$

$-4y = 12$

$y = -3$ (0, –3) = B

**(c)**




**(d)** $\sqrt{(0-4)^2 + (-3-0)^2}$ ← Distance formula: See page 18 of *Formulae and Tables*.

$\sqrt{16 + 9}$

$\sqrt{25} = 5$ ←

Or use Pythagoras's Theorem.

$|AB|^2 = 3^2 + 4^2$

$= 9 + 15$

$= 25$

$|AB| = \sqrt{25} = 5$

**(e)** $\frac{-3-0}{0-4}=\frac{-3}{-4}=\frac{3}{4}$ ← Slope formula: See page 18 of *Formulae and Tables.*

**15.** **(a)**

| | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| **T** | (1, T) | (2, T) | (3, T) | (4, T) | (5, T) |
| **H** | (1, H) | (2, H) | (3, H) | (4, H) | (5, H) |

**(b)** $5 \times 2 = 10$ ← Or count the outcomes

**(c)** (1, T) (3, T) (5, T) $= \frac{3}{10}$

**(d)** $\frac{2}{10}=\frac{1}{5}$ ← (2, H) (4, H)

**(e)** Answer: Both are correct.

Explanation: Since there are 3 prime and 3 odd numbers on the spinner

Prime Numbers = {2, 3, 5}

Odd Numbers = {1, 3, 5}

**16.** A population is when everybody is surveyed (e.g. the entire school). A sample is when only a small portion of the population is surveyed (e.g. Third Years).

**17.** **(a)**

| | |
|---|---|
| 1 | 1 4 |
| 2 | 2 2 2 3 9 |
| 3 | 0 2 3 4 4 9 |
| 4 | 1 3 |

key 4|1 = 41

**(b)** 15

**(c)** 22 ← Mode = Most common

**(d)** 43 − 11 = 32 ← Range = Largest number – Smallest number

**(e)** 30 ← Median is the middle number when the numbers are arranged in order.

**(f)** He is the best in the class.

# Educate.ie Sample 2
# Paper 2

**1.** **(a)** $\frac{56}{2} = 28$ cm

Radius = half the diameter

**(b)** $2\pi r = 2(3{\cdot}142)(28) = 175{\cdot}952$
$= 176$ cm

Length of circle: $= 2\pi r$
See page 8 of *Formulae and Tables*.

**(c)** $1{\cdot}76 \text{ m} \times 250 = 440$ m

100 cm = 1 m
176 cm = 1·76 m

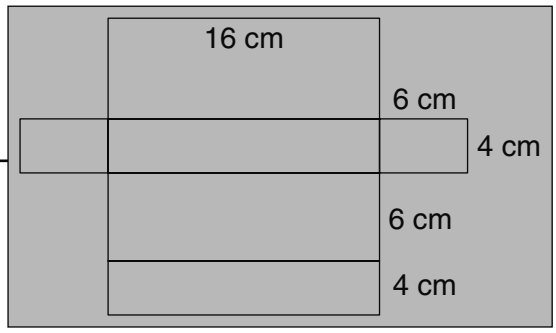
**2.** **(a)** $16 \times 4 \times 6 = 384$ cm$^3$

Volume of block = Length × Breadth × Height

**(b)** 1 cube $= 2 \times 2 \times 2 = 8$ cm$^3$

No. of cubes $= \frac{384}{8} = 48$ cubes

**(c)** $2(16 \times 4) + 2(16 \times 6) + 2(4 \times 6)$
$= 128 + 192 + 48$
$= 368$ cm$^2$




**3.** **(a)** Certain

**(b)** Unlikely

**(c)** Likely

**(d)** Even chance

**(e)** Impossible

**4.** **(a)** $180 - 90 - 50 = 40°$
Since the three angles in a triangle add up to 180°

**(b)** sin 40°
$= 0{\cdot}642787609$
$= 0{\cdot}64$

Calculator: sin 4 0 =

**(c)** $\cos 50 = \frac{|QR|}{8}$
$|QR| = 8 \cos 50$
$= 5{\cdot}1$ m

Calculator: 8 cos 5 0 =
Or
8 sin 4 0 =

**5. (a)**

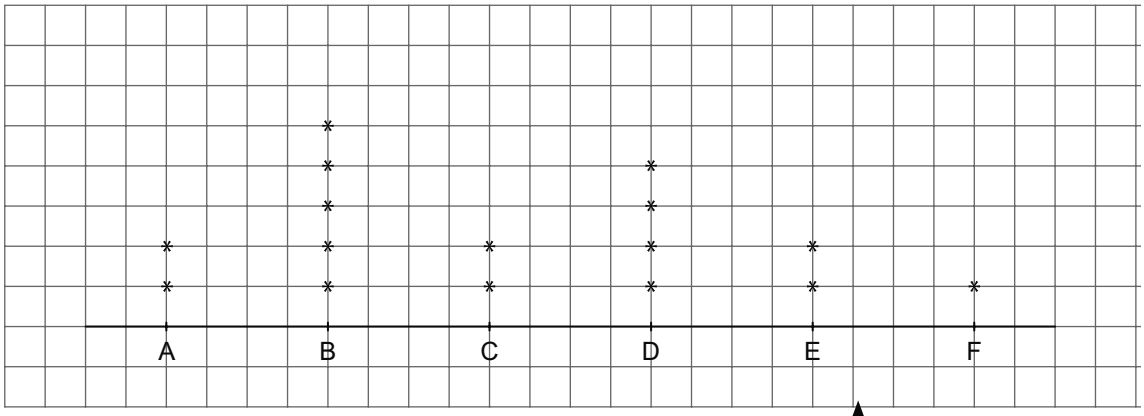
| | **Fish (F)** | **Beef (B)** | **Lamb (L)** | **Pasta (P)** |
|---|---|---|---|---|
| **Cake (C)** | (F, C) | (B, C) | (L, C) | (P, C) |
| **Ice cream (I)** | (F, I) | (B, I) | (L, I) | (P, I) |
| **Jelly (J)** | (F, J) | (B, J) | (L, J) | (P, J) |

**(b)** $4 \times 3 = 12$

This is the Fundamental Principle of Counting. Choosing from 4 and then choosing from 3 gives a total of $4 \times 3$ options.

**(c)** 3

**6. (a)**




**(b)** B

The most common grade

This is often called a dot plot.

**(c)** $2 + 5 + 2 = \frac{9}{16} \times 100 = 56\%$

**(d)** Disagree as only 3 students did not pass and 56% got a grade A, B or C.

**7. (a)** $\frac{8}{30} = \frac{4}{15}$

**(b)** $\frac{15}{30} = \frac{1}{2}$

**(c)** $\frac{7}{30}$

**(d)** $\frac{23}{30}$

**8. (a)** Cuts $x$ axis $7x - 2(0) = -14$

$7x = -14$

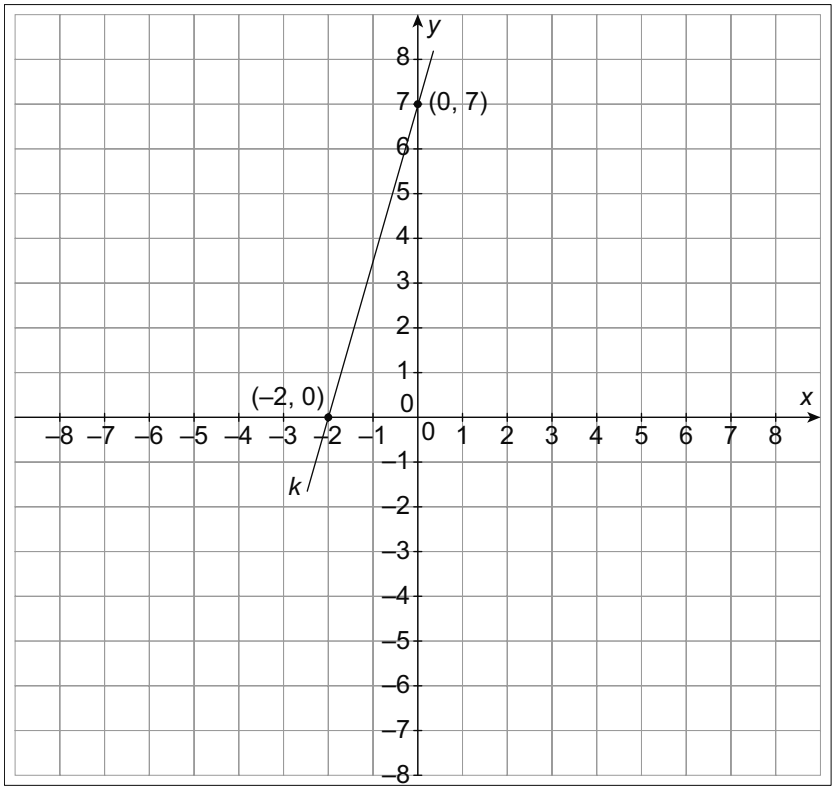
$x = -2$ $\quad (-2, 0)$

Cuts $y$ axis $7(0) - 2y = -14$

$2y = 14$

$y = 7$ $\quad (0, 7)$

**(b)**




**(c)** $\dfrac{0-7}{-2-0} = \dfrac{-7}{-2} = \dfrac{7}{2}$

← Slope formula: See page 18 of *Formulae and Tables*.

**9. (a)** $x + 2x = 3x = 90°$

$x = 30°$

The 2 angles $x$ and $2x$ make a right (90°) angle.

**(b)** $x = 122°$

A straight angle adds up to 180° degrees.

$180 - 58 = 122°$

**10. (a)** $\cos 60 = 0{\cdot}5$

**(b)** $\cos 60 = \dfrac{|PR|}{12}$

$|PR| = 12 \cos 60$

$= 6$

← Calculator: 1 2 cos 6 0 =

**11. (a)** $\dfrac{2+5+11}{3} = \dfrac{18}{3} = 6$ years

**(b)** $360 - 150 - 30 - 60 = 120°$

**(c)** $150° = 10$ students

$15° = 1$ student

$30° = 2$ students

Therefore, 2 students study Italian.

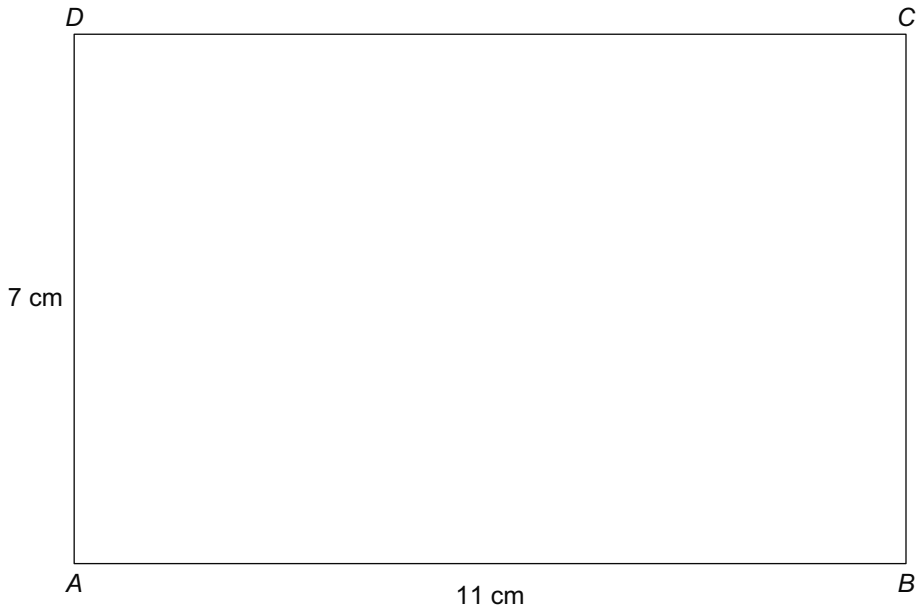
**(d)** $15° = 1$ student

$360 \div 15 = 24$ students

**(e)** $360 - 60 = 300°$

$300 \div 15 = 20$ students

**12. (a)**




Steps:

1. Draw a line 11 cm in length with a ruler. Label it as $AB$.
2. With the centre of the protractor on $A$, mark out an angle of 90°.
3. With a compass, mark off 7 cm along the 90° line. Label the point 7 cm from $A$ as $D$.
4. With the centre of the protractor on $B$, mark out an angle of 90°.
5. With a compass, mark off 7 cm along the 90° line. Label the point 7 cm from $B$ as $C$.
6. Join $D$ to $C$.

**(b)** Measure using your ruler.

$|AC| = 13$ cm

Or use Pythagoras's Theorem

$|AC|^2 = 11^2 + 7^2$

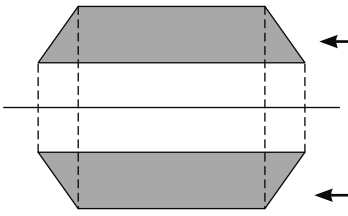
$= 121 + 49$

$= 170$

$|AC| = \sqrt{170} = 13{\cdot}04$ cm

**(c)** It divides the angle $DAB$ into two unequal angles.

**13. (a)**




**(b)** Answer: No.

Explanation: The lengths of the sides and the angles remain the same. Axial symmetry merely turns the object upside down.

**14. (a)**

$$\begin{array}{r} 18{:}50 \\ -\ \underline{15{:}20\ \ } \\ 3 \text{ hrs } 30 \text{ mins} \end{array}$$

**(b)** $\text{Speed} = \dfrac{182}{3{\cdot}5} = 52$ km/h

$\text{Speed} = \dfrac{\text{Distance(km)}}{\text{Time(hours)}}$

**(c)** $\text{Time} = \dfrac{182}{45{\cdot}5} = 4$ hours

**15.** **(a)** Only people interested in reading books would go to a book shop.

**(b)** Meet people entering a shopping centre with many alternative shops.

**(c)** 1. What are your hobbies?

2. How often do you purchase a book?

**16.** Side $= \frac{27 \text{ cm}}{3} = 9 \text{ cm}$

In an equilateral triangle, the three sides are equal, therefore one side is 27 cm divided by 3.

# Educate.ie Sample 3
# Paper 2

**1.** **(a)** $75 + 25 = 100$ m

**(b)** $110 + 75 + 80 + 25 + 30 + 100 = 420$ m ← Add the lengths of all of the sides.

**(c)** $420 \div 5 = 84 \times €47{\cdot}30 = €3{,}973{\cdot}20$

**2.** **(a)** $\pi r^2 = (3{\cdot}142)(4)(4) = 50{\cdot}272$ cm$^2$ ← Area of a disc: $= \pi r^2$ See page 8 of *Formulae and Tables*.

**(b)** $\pi r^2 h = (3{\cdot}142)(4)(4)(12{\cdot}2)$

$= 613{\cdot}3184$

$= 613$ cm$^3$

← Volume of a Cylinder: $= \pi r^2 h$ See page 10 of *Formulae and Tables*.

**3.** $50 \times 25 = 1250$ m

$1250 \div 1000 = 1{\cdot}25$ km ← 1000 m = 1 km

**4.** A ← Probability = 0

E ← Probability = 1

B ← Probability $= \frac{2}{8} = \frac{1}{4}$

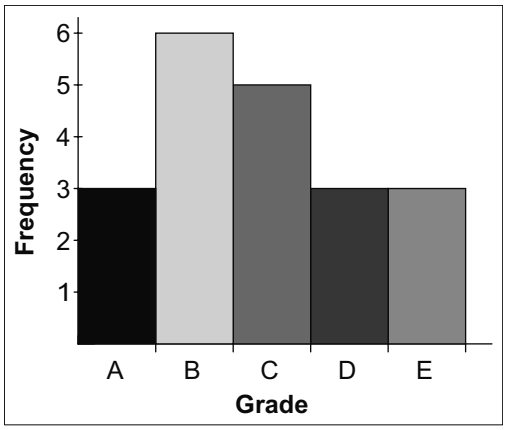
C ← Probability $= \frac{4}{8} = \frac{1}{2}$

D ← Probability $= \frac{6}{9} = \frac{2}{3}$

**5.** **(a)**

| **Grade** | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| **Tally** | 𝍸 | 𝍸 \| | 𝍸 | 𝍸 | 𝍸 |
| **Frequency** | 3 | 6 | 5 | 3 | 3 |

**(b)**




This is a histogram. A bar chart, pie chart or a line graph would also display the data.

**(c)** B

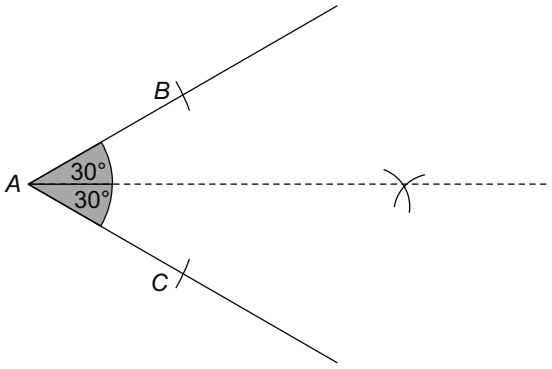
The most common grade

**(d)** $\frac{3}{20}$

**(e)** $\frac{11}{20}$

Probability = $\frac{\text{Favourable outcomes}}{\text{Total outcomes}}$

**6.**




Steps:

1. Place the point of the compass on $B$ and draw an arc of any radius.
2. Place the point of the compass on $C$ and keeping the same radius, draw an arc to cut the first arc.
3. Join the point where these two arcs cut to $A$.

**7. (a)** Using Pythagoras's Theorem

$$(13)^2 = (5)^2 + (BC)^2$$

$$\sqrt{169 - 25} = |BC|$$

$$12 \text{ m} = |BC|$$

**(b)** $\cos A = \frac{5}{13}$

$\cos A = 0{\cdot}384615384$

$A = \cos^{-1}(0{\cdot}384615384)$

$A = 67°$

If you have a Casio Calculator press SHIFT cos then type in 0·38461 and press =. This gives an answer of 67·38 degrees = 67° to the nearest degree.

**8.** Categorical
Numerical
Categorical
Categorical
Numerical

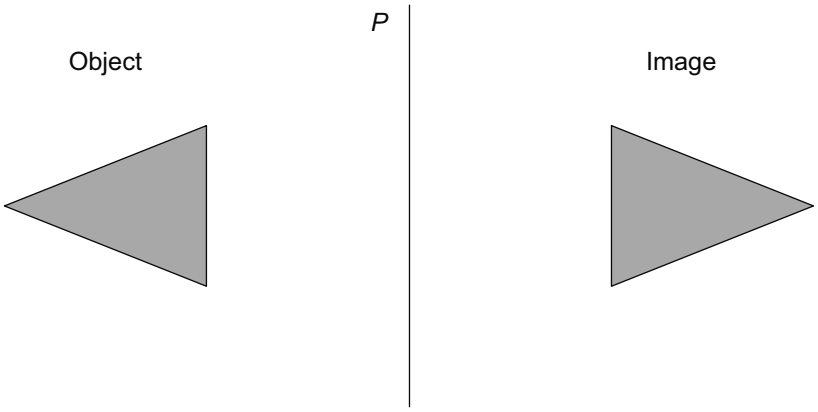
**9. (a)** $5 \times 3 = 15$

This is the Fundamental Principle of Counting. Choosing from 5 and then choosing from 3 gives a total of $5 \times 3$ options.

**(b)**

| | White | Blue | Orange |
|---|---|---|---|
| **Silk** | (White, Silk) | (Blue, Silk) | (Orange, Silk) |
| **Nylon** | (White, Nylon) | (Blue, Nylon) | (Orange, Nylon) |
| **Cotton** | (White, Cotton) | (Blue, Cotton) | (Orange, Cotton) |
| **Denim** | (White, Denim) | (Blue, Denim) | (Orange, Denim) |
| **Linen** | (White, Linen) | (Blue, Linen) | (Orange, Linen) |

**10. (a)**




**(b)** Answer: No.

Explanation: In both the object and the image the sides lengths and angles remain the same.

**11.** $A = 125°$ (3 angles in $\Delta$ equal 180°)

$B = 40°$ Alternate angle

$C = 15°$ Alternate angle

**12. (a)** 1. Questions must be relevant to the survey being done.

2. No biased or misleading questions to be asked.

**13. (a)** 5

Use Pythagoras's Theorem

$13^2 = 12^2 + |BC|^2$

$169 = 144 + |BC|^2$

$169 - 144 = |BC|^2$

$25 = |BC|^2$

$|BC| = \sqrt{25} = 5$

You should know some Pythagorean Triplets such as

3, 4, 5: 6, 8, 10: 5, 12, 13.

**(b)** $\sin A = \dfrac{\text{Opposite}}{\text{Hypotenuse}} = \dfrac{5}{13}$

**(c)** $\cos |\angle PQR| = \dfrac{4}{10} = \dfrac{2}{5}$

**(d)** $\cos |\angle PQR| = \dfrac{2}{5}$

$\cos |\angle PQR| = 0{\cdot}4$

$|\angle PQR| = \cos^{-1}(0{\cdot}4) = 66°$

SHIFT cos then type in 0·4 and press =.

This gives an answer of 66·4218 degrees = 66° to the nearest degree.

**14. (a)** $\dfrac{4 + 6 + 7 + 12 + 16}{5} = \dfrac{45}{5} = 9$

**(b)** 4

**(c)** $2 + 4 + 6 + 10 + 5 + 3 = 30$

**(d)** D — The most common grade

**(e)** $5 + 3 = 8$

**(f)** $\frac{6}{30} \times 100$

$\frac{1}{5} \times 100 = 20\%$

**15.** **(a)** $\left(\frac{3+1}{2}, \frac{5-7}{2}\right)$ ← Midpoint formula: See page 18 of *Formulae and Tables*.

$\left(\frac{4}{2}, \frac{-2}{2}\right) = (2, -1)$

**(b)** $\frac{-7-5}{1-3} = \frac{-12}{-2} = 6$ ← Slope formula: See page 18 of *Formulae and Tables*.

**(c)** $m = 6$ Point (3, 5)

$y - 5 = 6(x - 3)$ ← Equation of a line formula: $y - y_1 = m(x - x_1)$. See page 18 of *Formulae and Tables.*

$y - 5 = 6x - 18$

$0 = 6x - y - 13$

**16.** Yes they are congruent

Both have a right angle

$|OQ| = |AB| = 6$ cm (side) ← As this is a right-angled triangle, the third side in both triangles is also equal. Therefore Side, Side, Side = Side, Side, Side which means the triangles are congruent.

$|OP| = |AC| = 4$ cm (side)

by RHS they are congruent.

**17.** $x = 70°$ Isosceles triangle

$180 - 70 - 70 = 40° = y$

3 angles in a triangle equal 180°

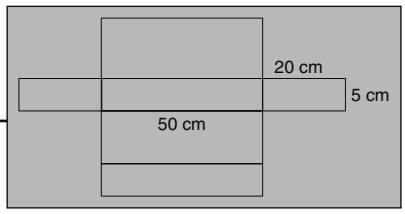
# Educate.ie Sample 4
# Paper 2

**1.** $2\pi r = 2 \times \frac{22}{7} \times 3{\cdot}5$
$= 22$ cm

Length of a circle: $= 2\pi r$
See page 8 of *Formulae and Tables*.

**2.** **(a)** $20 \times 50 \times 5 = 5000$ cm$^3$

**(b)** $2(20 \times 50) + 2(20 \times 5) + 2(50 \times 5)$
$= 2000 + 200 + 500$
$= 2700$ cm$^2$




**3.** **(a)** $7 \times 2 = 14$

This is the Fundamental Principle of Counting. 7 options and then 2 options give a total of $7 \times 2$ possibilities.

**(b)**

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|---|
| **Heads (H)** | (1, H) | (2, H) | (3, H) | (4, H) | (5, H) | (6, H) | (7, H) |
| **Tails (T)** | (1, T) | (2, T) | (3, T) | (4, T) | (5, T) | (6, T) | (7, T) |

**(c)** $\frac{3}{14}$

Probability $= \frac{3}{14}$

**4.** **(a)** Vandalism

**(b)** Speeding

**(c)** $5 + 3 + 4 + 6 + 2 = 20$

**(d)** $\frac{4}{20} = \frac{1}{5} = 20\%$

**5.** **(a)** $180 - 90 - (90 - 41) = |\angle BAC|$
$180 - 90 - 49 = |\angle BAC|$
$41° = |\angle BAC|$

Or $|\angle BAC| = |\angle DCA|$ Reason: Alternate angles

**(b)** $\tan 41° = \frac{35}{|AB|}$
$|AB| = 35 \div \tan 41°$
$|AB| = 40$ m

Calculator: tan 4 1 = 0·869286. Now divide 35 by 0·869286 to give 40·26 = 40 m to the nearest metre.

**6.** **(a)** $180°$

The three angles of a triangle add to $180°$.

**(b)** $180 - 51 - 79 = 50°$

**(c)** $180°$

A straight angle equals $180°$.

**(d)** The exterior angle $D$ is equal to the sum of the two interior opposite angles (51° + 79°).

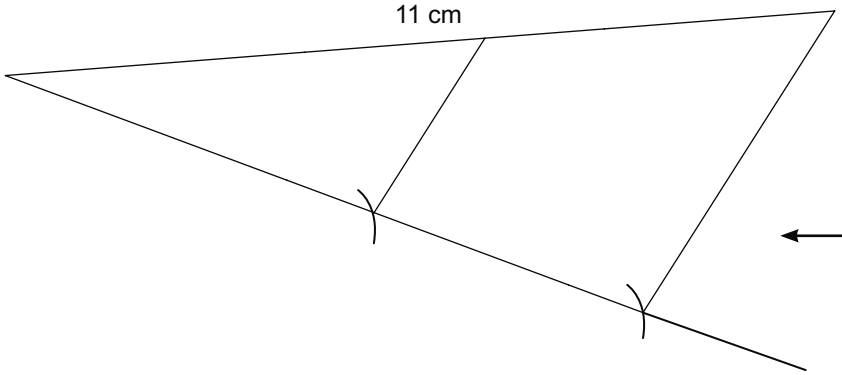
**(e)** $180 - 50 = 130°$

**7. (1)** Do you eat bread?

**(2)** What is your favourite type of bread? ← Or any other relevant question

**(3)** How much would you pay for fresh, wholesome bread?

**8.**




Steps:

1. Draw, with a ruler, a line 11 cm in length.
2. Draw another line at an angle to the first line.
3. With a compass, draw two arcs of equal length to cut the line that is at an angle to the line of 11 cm.
4. Join the outside arc to the end of the 11 cm line.
5. Through the other arc, draw a line parallel to the line going through the first arc. The 11 cm line will now be divided into two equal segments. Note: one could just bisect the 11 cm line.

**9. (a)** $\frac{8-0}{0+4} = \frac{8}{4} = 2$ ← Slope formula: See page 18 of *Formulae and Tables*.

**(b)** $y - 0 = 2(x + 4)$

$y = 2x + 8$

$0 = 2x - y + 8$

Equation of a line formula: $y - y_1 = m(x - x_1)$. See page 18 of *Formulae and Tables*. Note: You can use either of the points as $(x_1, y_1)$.

**10.** The median is the middle number when the data points are arranged in order. If there is an odd number of data points there is no problem. Example: the median of 2, 5, 7, 11, 13 is 7 as 7 is the middle number when they are arranged in order. If there is an even number of numbers then the average (mean) of the middle two numbers is taken when they are arranged in order. Example 2, 5, 8 13. The median is $(5 + 8) \div 2 = 6{\cdot}5$ which was not in the original data set.

**11. (a)** $2(0) + 3y - 6 = 0$

$3y = 6$

$y = 2 \quad R = (0, 2)$

**(b)** $(0, 2) \rightarrow (0, 0) \rightarrow (0, -2)$

Reason: The $x$ parts $0 \rightarrow 0 \rightarrow 0$ and the $y$ parts $2 \rightarrow 0 \rightarrow -2$. 0 is the centre of each of the maps.

**12. (a)** The listeners were being bribed with prizes.

**(b)** Only people with internet access could reply to the survey.

**(c)** Only people who exercise would have been in his gym.

**13. (a)** 10 ← The hypotenuse is always the longest side in a right-angled triangle.

**(b)** $\frac{6}{10} = \frac{3}{5}$ ← $\cos C = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

**(c)** $\cos C = \frac{3}{5}$

$\cos C = 0{\cdot}6$

$C = \cos^{-1}(0{\cdot}6)$ ← Calculator: SHIFT cos 0 · 6 = $53{\cdot}1301$.

$C = 53°$

**14. (a)** $(-2, -1)$

**(b)** $(-2, -1) \to (0, -1) \to (2, -1)$

**(c)** $(-2, -1) \to (-2, 0) \to (-2, 1)$

**(d)** $(-2, -1) \to (0, 0) \to (2, 1)$

**15. (a)**

| | |
|---|---|
| 25 000 | 34 000 |
| 19 000 | 32 000 |
| 6000 | 2000 |

**(b)** $\frac{18\,000}{25\,000} \times \frac{100}{1} = 72\%$ $\frac{26\,000}{29\,000} \times \frac{100}{1} = 90\%$

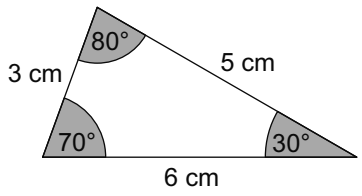
**(c)** $35\,000 - 29\,000 = €6000$

**(d)** Answer: Yes

Reason: Males' salary went up €10 000.

Females' salary went up €15 000.

**16.** A scalene triangle has 3 sides of different length and 3 angles of different size.




**17. (a)**

| **Grade** | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| **Tally** | 𝍸 | 𝍸 \| | 𝍸 \|\| | \| | \|\| |
| **Frequency** | 3 | 5 | 4 | 1 | 2 |

**(b)** B ← The most common grade

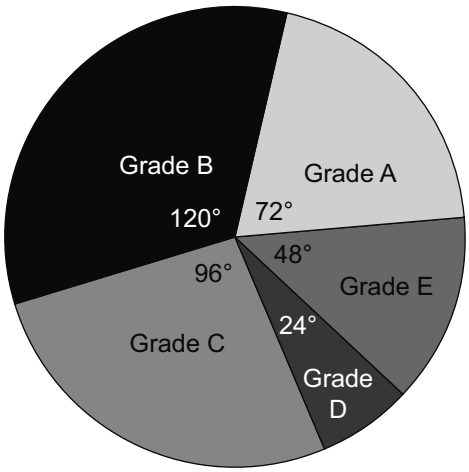
**(c)** Grade A $= \frac{3}{15} \times 360 = 72°$

Grade B $= \frac{5}{15} \times 360 = 120°$

Grade C $= \frac{4}{15} \times 360 = 96°$

Grade D $= \frac{1}{15} \times 360 = 24°$

Grade E $= \frac{2}{15} \times 360 = 48°$




**(d)** $\frac{12}{15} = \frac{4}{5}$

**(e)** I disagree, as 12 out of 15 got a grade A, B or C.

# Educate.ie Sample 5
# Paper 2

**1.** (Area of big ▭) – (Area of small ▭) ← ▭ Means rectangle.

$(30 \times 15) - (27 \times 12)$

$450 - 324$

$= 126 \text{ cm}^2$

**2.** **(a)** $32 \div 2 = 16$ cm ← The radius is half the diameter.

**(b)** $\pi r^2 h = \pi(16)(16)(50)$

$= 12\,800\pi \text{ cm}^3$ ← Volume of a cylinder: $= \pi r^2 h$. See page 10 of *Formulae and Tables*. "in terms of $\pi$" means leave $\pi$ in the answer.

**(c)** $\pi r^2 h = \pi(12)(12)(80)$

$= 11\,520\pi \text{ cm}^3$

**(d)** The first gold rod, 50 cm high and with radius of 16 cm. ← The first gold rod has a greater volume of gold.

**3.** 110° 50° 230° 90°

**4.** **(a)** $2 \times 2 = 4$ ← HH, HT, TH, TT where Head = H, Tail = T

**(b)** 13 ← Ace, Two, Three, Four, Five, Six, Seven, Eight, Nine, Ten, Jack, Queen, King of clubs.

**(c)** N, D, L, V, R, D 6

**5.** **(a)** $\frac{4}{12} = \frac{1}{3}$

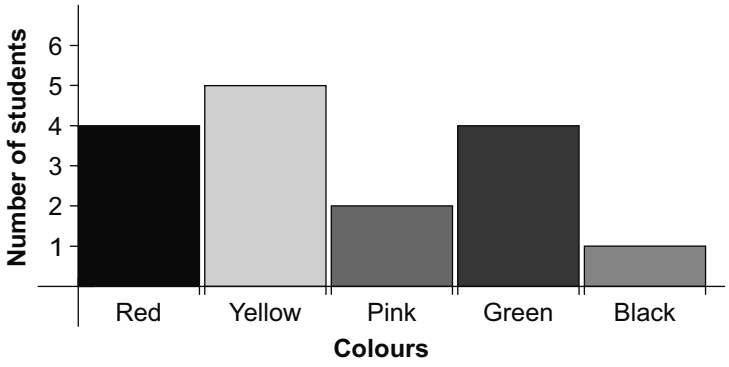
**(b)** $\frac{2}{12} = \frac{1}{6}$

**(c)** $\frac{1}{12}$

**(d)** $\frac{10}{12} = \frac{5}{6}$

**(e)** $\frac{10}{12} = \frac{5}{6}$

**6.** **(a)**




**(b)** 2

**(c)** Yellow ← This is the most common colour.

**(d)** $\frac{4}{16} = \frac{1}{4}$

**(e)** Disagree

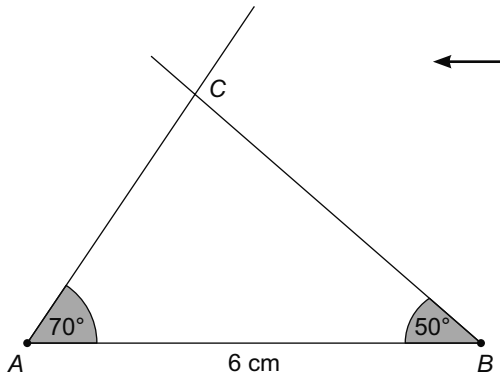
Black $= \frac{1}{16} \times 100 = 6\frac{1}{4}\%$ ← The other colours have more than a 10% chance of being chosen.

**7.** $2(8) + 3(-2) - 10 = 0$

$16 - 6 - 10 = 0$

$0 = 0$ ← The point satisfies the equation of the line it is on.

**8.**



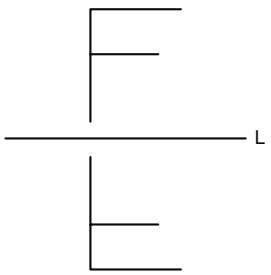

Steps:

1. With a ruler draw a line segment 6 cm in length. Label as *AB*.
2. Place the centre of a protractor at the point *A* and mark off an angle of 70°.
3. Draw a line from *A* at 70°.
4. Place the centre of a protractor at the point *B* and mark off an angle of 50°.
5. Draw a line from *B* at 50° until it crosses the 70° line. Label this *C*.

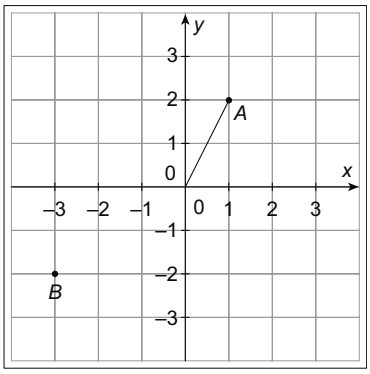
**9.** $4 \times 2 = 8$ ← This is the Fundamental Principle of Counting. Choosing from 4 and then choosing from 2 gives a total of $4 \times 2$ options.

**10.** He only surveyed women.
He only surveyed people going to or from training in the gym.

**11.**



**12.** **(a)**




**(b)** Done

**(c)** $\frac{2-0}{1-0} = 2$ ← Slope formula: See page 18 of *Formulae and Tables*.

**(d)** $\frac{-2-2}{-3-1} = \frac{-4}{-4} = 1$

$\left(\frac{(x_1+x_2)}{2}, \frac{(y_1+y_2)}{2}\right)$

$\left(\frac{1-3}{2}, \frac{2-2}{2}\right)$

$(-1, 0)$

Midpoint formula: See page 18 of *Formulae and Tables*.

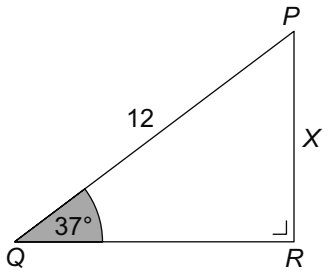
**(e)** $\sqrt{(-3-1)^2 + (-2-2)^2}$

$\sqrt{16+16}$

$\sqrt{32} = 5{\cdot}7$ units

Distance formula: See page 18 of *Formulae and Tables*.

**13.**




**(a)** 12 ← The hypotenuse is always the longest side in a right-angled triangle.

**(b)** $X$

**(c)** $\text{Sin } 37 = \frac{X}{12}$

**(d)** $\text{Sin } 37° = 0{\cdot}6$

**(e)** $\text{Sin } 37 = \frac{X}{12}$ ← $\text{Sin} = \frac{\text{Opposite}}{\text{Hypotenuse}}$

$0{\cdot}6 = \frac{X}{12}$

Calculator sin 3 7 =

$X = 12(0{\cdot}6)$

$X = 7{\cdot}2$

**14.** **(a)** $\frac{25+20+50+35+50}{5}$

$= \frac{180}{5} = 36$ DVDs

**(b)** $6 \times 40 = 240$

$\underline{-\ 180}$

60 DVDs

**15. (a)** $180° - 90° - 47° = 43° = A$

since 3 angles in a triangle add up to 180°

$180 - 43 - 62 = 75° = B$

since a straight angle equals 180°

**(b)** Alternate angles: $D$ and $F$

$C$ and $E$

Corresponding angles: $A$ and $C$

$B$ and $D$

Multiple possible answers.

**16. (a)**

| **Number of days absent** | **0** | **1** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|---|
| **Tally** | \|\|\|\| \| | \|\|\| | \|\|\| | \|\|\|\| | \|\|\| | \|\|\|\| \| | \|\|\|\| |
| **Number of pupils** | 6 | 3 | 3 | 5 | 3 | 6 | 4 |

**(b)** $$\frac{(0 \times 6) + (1 \times 3) + (2 \times 3) + (3 \times 5) + (4 \times 3) + (5 \times 6) + (4 \times 6)}{30}$$

$$= \frac{0 + 3 + 6 + 15 + 12 + 30 + 24}{30}$$

$$= \frac{90}{30} = 3 \text{ days}$$

**(c)** $5 + 3 + 6 + 4 = 18$

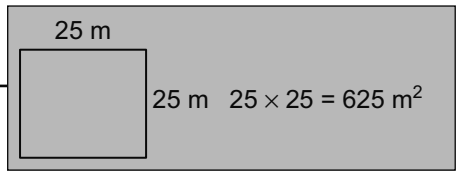
$$\frac{18}{30} \times 100 = 60\%$$

**(d)** $$\frac{6}{30} = \frac{1}{5}$$

**(e)** $$\frac{13}{30}$$

# Educate.ie Sample 6
# Paper 2

**1.** **(a)** $\sqrt{625} = 25$ m




**(b)** $4 \times 25$ m $= 100$ m

**2.** **(a)** $\pi r^2 h = (3{\cdot}14)(46)(46)(150)$
$= 996\,636 \div 2$
$= 498\,318$ cm$^3$

Volume of a Cylinder: $= \pi r^2 h$
See page 10 of *Formulae and Tables*.

**(b)** $498\,318 \div 6 = 83\,053$ minutes

**3.** $9 \times 3 = 27$ codes

This is the Fundamental Principle of Counting. Choosing from 9 and then choosing from 3 gives a total of $9 \times 3$ options.

**4.** **(a)** $203 \times 4 = 812$ km

**(b)** $245 \times 3 = 735$ km

**(c)** $\frac{812 + 735}{7} = \frac{1547}{7} = 221$ km

**(d)** $230 \times 8 = 1840$ km
$1840\text{ k} - 1547 = 293$ km

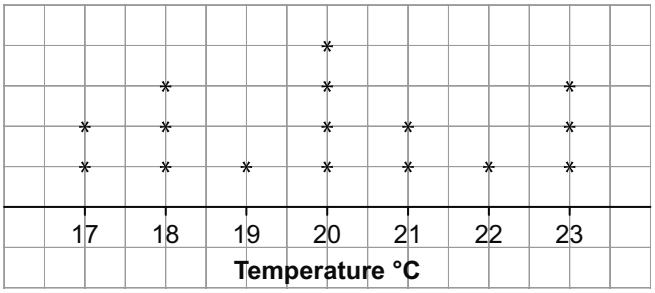
**5.** **(a)** Numerical data is when the answer given is only a number.

**(b)** Categorical data is when the answers are in the form of words.

**(c)** How old are you?
What colour are your eyes?

Any other similar questions

**6.** **(a)**



**(b)** 20°C ← The most common temperature

**(c)** 6 days

**(d)** $\frac{10}{16} = \frac{5}{8}$

**(e)** $23 - 17 = 6°C$ ← Maximum temperature – Minimum temperature

**(f)** $$\frac{(2 \times 17) + (3 \times 18) + (1 \times 19) + (4 \times 20) + (2 \times 21) + (1 \times 22) + (3 \times 23)}{16}$$

$$\frac{34 + 54 + 19 + 80 + 42 + 22 + 69}{16} = \frac{320}{16} = 20°C$$

**7.** Since it is congruent, 5 cm is across from 30°.

Hence Y = 5 cm

Angle *x* is across from 10 cm.

$180 - 70 - 30 \Rightarrow 80° = X$

**8.** All the angles must add up to 360°.

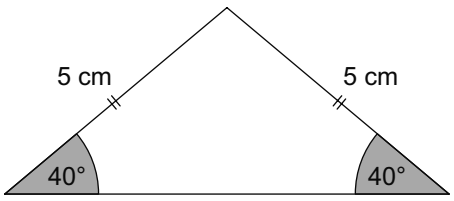
$X + 78 + 2X + 42 = 360°$

$3X = 360 - 78 - 42$

$3X = 240$

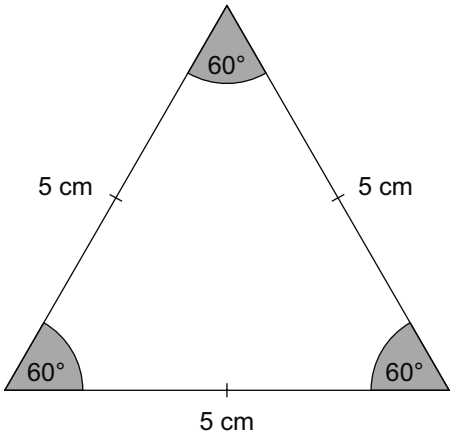
$X = 80°$

**9.** **(a)** A triangle with 2 sides and 2 angles equal in measure



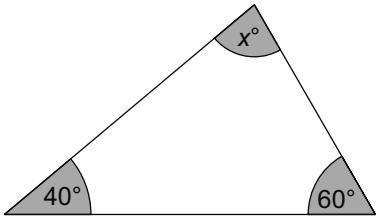

← In an isosceles triangle, two sides and two angles are equal.

**(b)** A triangle with 3 sides and 3 angles equal in measure




← An equilateral triangle has three equal sides and hence three equal angles.

**(c)** $180 - 40 - 60 \Rightarrow 80° = x$

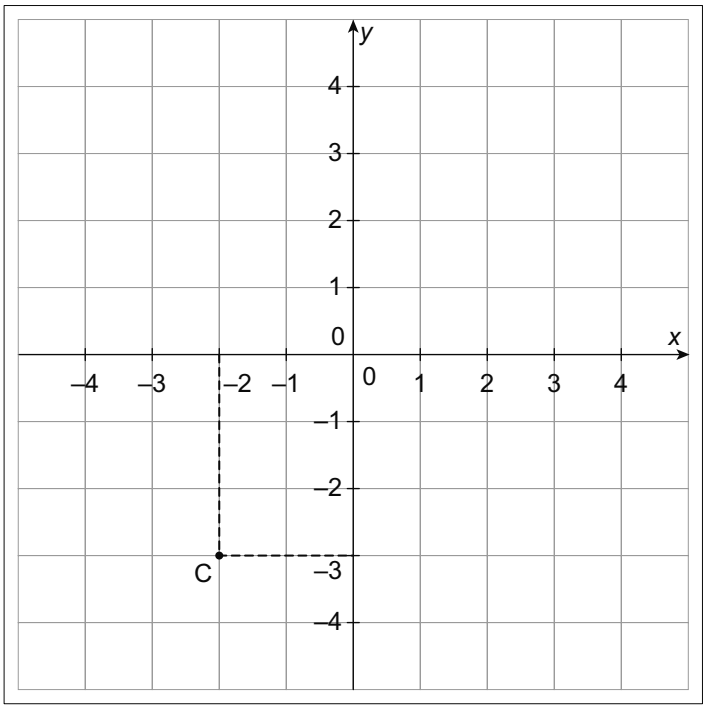



**(d)** Scalene triangle ← A triangle with no equal sides and no equal angles

**10.** Mean = 5 so total age = 15 years

4, 4, 7 years ← As the mode is 4, two of the dogs must be aged 4. The third dog must then be 7 because 4 + 4 + 7 = 15

**11.** **(a)**




**(b)** $(-2, -3) \rightarrow (0, -3) \rightarrow (2, -3)$

**(c)** $(-2, -3) \rightarrow (-2, 0) \rightarrow (-2, 3)$

**(d)** $(-2, -3) \rightarrow (0, 0) \rightarrow (2, 3)$

**12.** **(a)** Hypotenuse

**(b)** 15

**(c)** $\frac{15}{17}$ ← $\text{Cos} = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

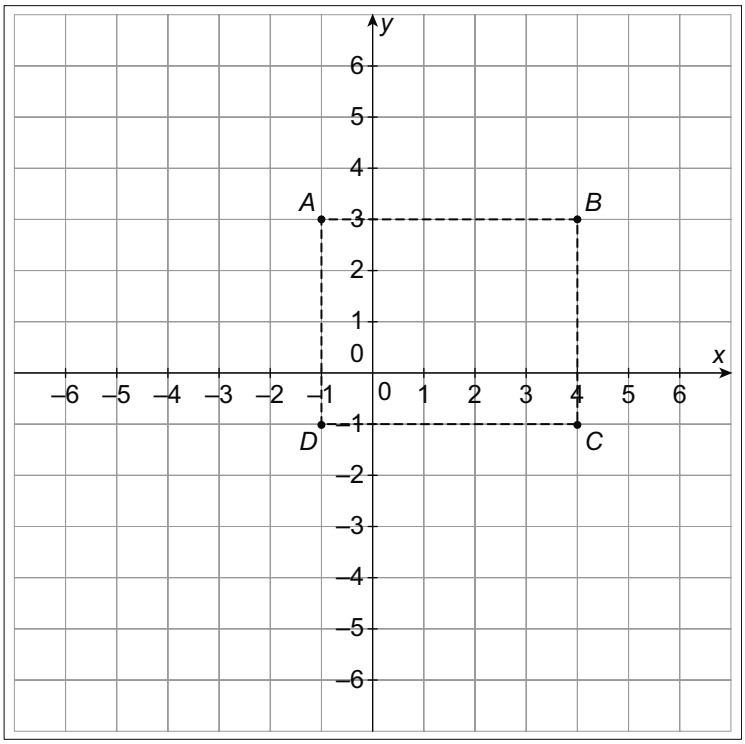
**(d)** $\cos A = \frac{15}{17}$

$\cos A = 0{\cdot}882352941$

$A = \cos^{-1}(0{\cdot}882352941)$

$A = 28°$

**13.** **(a)**




**(b)** D = (−1, −1)

**(c)** D = (−1, −1)

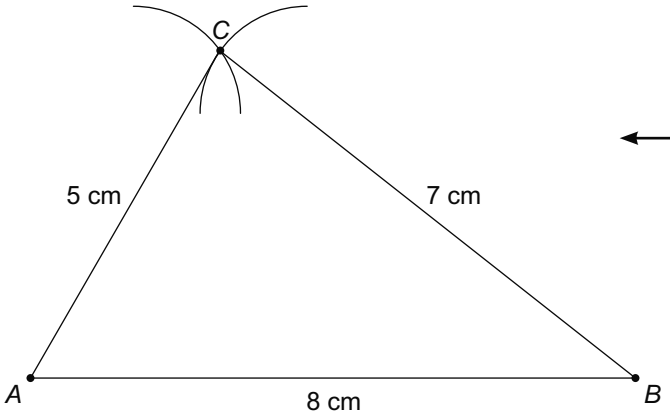
**(d)** All the angles are right angles. Opposite sides are equal in measure.

**(e)** $\left(\frac{-1-1}{2}, \frac{3-1}{2}\right) = (-1, 1) = E$

Midpoint formula: See page 18 of *Formulae and Tables*.

**(f)** (4, 1)

**14.**




Steps:

1. With a ruler, draw a line segment 8 cm in length. Label as *AB*.
2. Place the compass on the point *A* and mark off an arc that is 5 cm from *A*.
3. Place the compass on the point *B* and mark off an arc that is 7 cm from *B*.
4. Label where the two arcs meet as *C*.
5. Join *C* to *A* and to *B*.

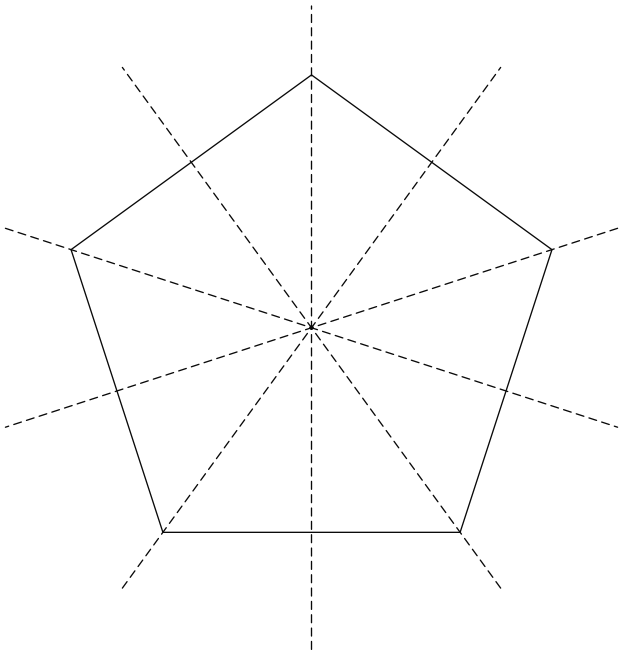
**15.** 180 − 108 = 72°

180° = 72° + 72° + $x$

$x$ = 36°

$y$ = 72° since it is an alternate angle.

**16.**



**17.** **(a)** $\frac{20}{200} = \frac{1}{10}$

**(b)** $\frac{100}{200} = \frac{1}{2}$

**(c)** $\frac{30}{200} = \frac{3}{20}$

**(d)** $\frac{100}{200} = \frac{1}{2}$

$$\text{Probability} = \frac{\text{Favourable outcomes}}{\text{Total outcomes}}$$

# Educate.ie Sample 7
# Paper 2

**1.** **(a)** $9 \times 4 = 36 \text{ m}^2$ ← Area of rectangle = Length × Breadth

**(b)** $36 \div 12 = 3$

3 tins of paint are needed.

**2.** **(a)** $10 \div 2 = 5$ cm ← Radius is half the diameter.

**(b)** $\pi r^2 h$ ← Volume of a Cylinder: $= \pi r^2 h$. See page 10 of *Formulae and Tables*.

$(3{\cdot}142)(5)(5)(8) = 628{\cdot}4 \text{ cm}^3$

**(c)** Volume of teapot $= 628{\cdot}4 \times 4{\cdot}5$

$= 2827{\cdot}8$

$= 2828 \text{ cm}^3$

**3.** $250 - 97 = 153$ cm ← 1 m = 100 cm

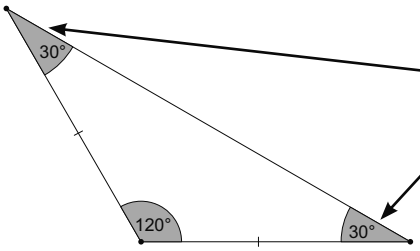
Answer 153 cm

**4.** **(a)** Isosceles ← In an isosceles triangle, two sides and two angles are equal.

**(b)** Add up to 180

**(c)** 1, 89 ← Acute

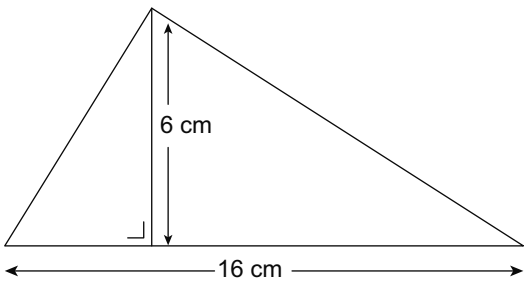
**(d)** See diagram




Greater than 0° and less than 90°

**(e)** Obtuse

**(f)**




Area $= \frac{1}{2}(16) \times 6$ ← Formula for the area of a triangle. See page 9 of *Formulae and Tables*.

$= 8 \times 6$

$= 48 \text{ cm}^2$

Sample 7 Educate.ie P2

**5.** **(a)** $2 \times 6 = 12$

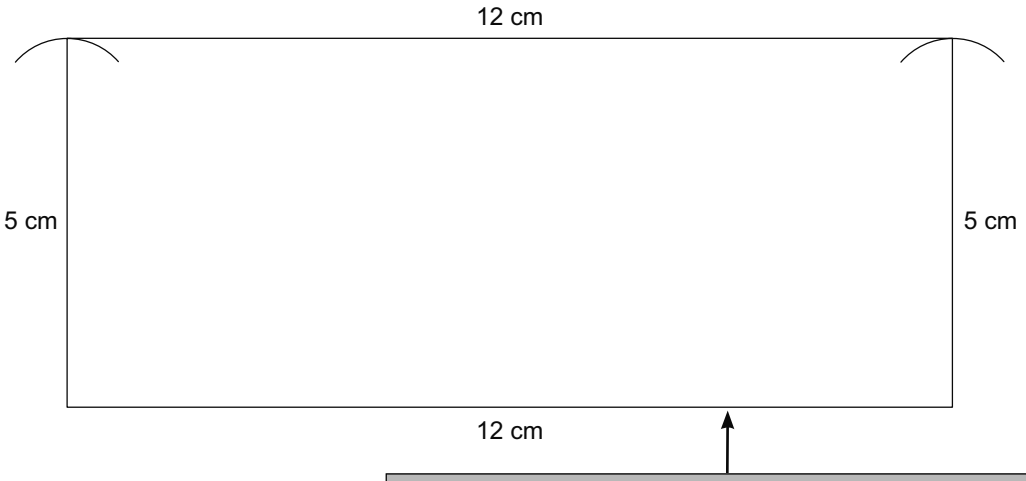
| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| H | H1 | H2 | H3 | H4 | H5 | H6 |
| T | T1 | T2 | T3 | T4 | T5 | T6 |

**(b)** 13

Ace, Two, Three, Four, Five, Six, Seven, Eight, Nine, Ten, Jack, Queen, King of diamonds.

**(c)** C, R, T, F, C, T = 6

**6.** **(a)**




Steps:

1. Draw a line 12 cm in length with a ruler.
2. With the centre of the protractor on one end of this line segment, mark out an angle of 90°.
3. With a compass, mark off 5 cm along the 90° line.
4. With the centre of the protractor on the other end point of the 12 cm line segment, mark out an angle of 90°.
5. With a compass, mark off 5 cm along the 90° line.
6. Join where the two compass arcs cut the perpendicular lines.

**(b)** Using ruler: 13 cm

**7.** They are congruent by SAS since

| | |
|---|---|
| $\|OA\| = \|OC\|$ | Side |
| $\|\angle AOB\| = \|\angle COD\|$ | Angle |
| $\|OB\| = \|OD\|$ | Side |

**8.** **(a)** Put in order of size

$-5, 2, 8, \textcircled{9}, 10, 11, 13$

Median = 9°C

Median is the middle value when put in order.

**(b)** Dara

**(c)** Aisling

**(d)** 6

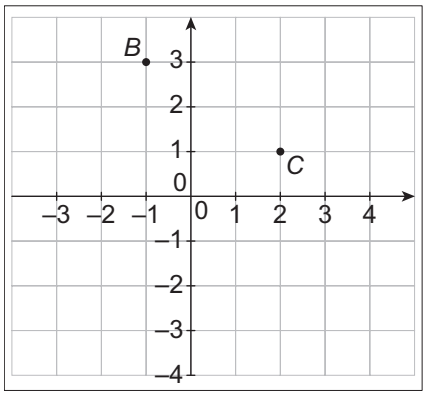
The maximum number of goals – minimum number of goals (8 – 2) = 6

**(e)** A bar chart, line plot or a histogram

**9.** $4 \times 2 = 8$

This is the Fundamental Principle of Counting. Choosing from 4 and then choosing from 2 gives a total of $4 \times 2$ options.

**10. (a)**




B = (−1, 3), C = (2, 1)

**(b)** $\left(\frac{-1+2}{2}, \frac{3+1}{2}\right) = \left(\frac{1}{2}, 2\right)$ ← Midpoint formula: See page 18 of *Formulae and Tables*.

**(c)** $\frac{1-3}{2+1} = \frac{-2}{3}$ ← Slope formula: See page 18 of *Formulae and Tables*.

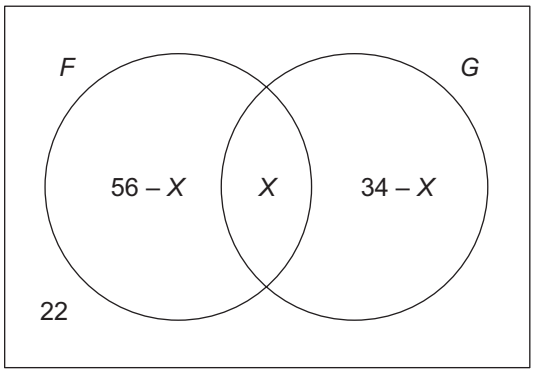
**(d)** $\sqrt{(1-3)^2 + (2+1)^2}$ ← Distance formula: See page 18 of *Formulae and Tables*.

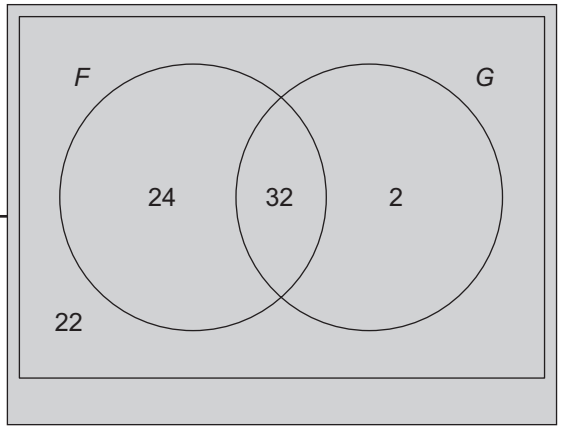
$\sqrt{(-2)^2 + (3)^2}$

$\sqrt{4+9}$

$\sqrt{13} = 3{\cdot}6$

**11. (a)** 80 = U




**(b)** $80 = 56 - X + X + 34 - X + 22$

$80 = 112 - X$

$X = 112 - 80$

$X = 32$ students

**(c)** $\frac{22}{80} = \frac{11}{40}$ ← $\text{Probability} = \frac{\text{Favourable outcomes}}{\text{Total outcomes}}$

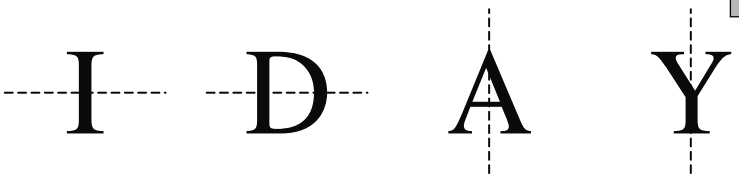
**(d)** $\frac{24}{80} = \frac{3}{10}$

Sample 7 Educate.ie P2

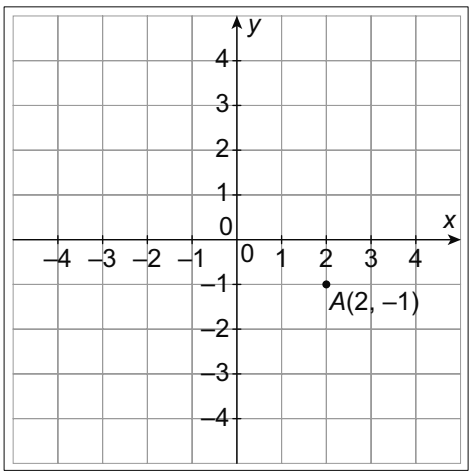
**12.** **(a)** An axis of symmetry is an imaginary line that can divide the shape into two halves.

**(b)** I DAY each have an axis of symmetry.

Equal but opposite orientation




**13.** **(a)**




**(b)** $(2, -1) \rightarrow (-2, -1)$

**(c)** $(2, -1) \rightarrow (2, 1)$

**(d)** $(2, -1) \rightarrow (0, 0) \rightarrow (-2, 1)$

**14.** $A = 72°$ corresponding angle

$B = 180° - 72° = 108°$ straight angle

**15.** **(a)**

| **Number on die** | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **Frequency** | 5 | 1 | 3 | 3 | 3 | 0 |

**(b)** 15

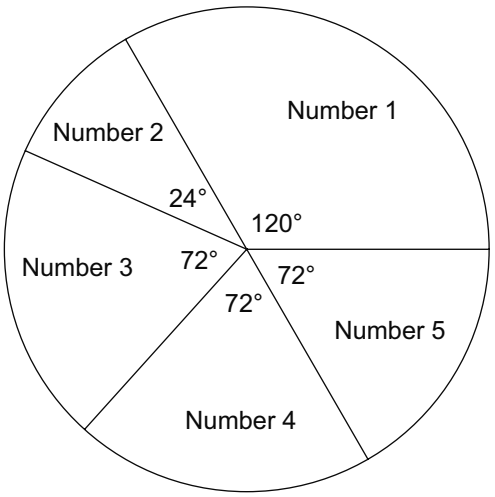
**(c)** Number 1 $= \frac{5}{15} \times 360 = 120°$

Number 2 $= \frac{1}{15} \times 360 = 24°$

Number 3 $= \frac{3}{15} \times 360 = 72°$

Number 4 $= \frac{3}{15} \times 360 = 72°$

Number 5 $= \frac{3}{15} \times 360 = 72°$




**(d)** 1

**(e)** 6

**(f)** Yes, because the number six does not occur in 15 throws.

As there are 15 trials and the number 6 does not occur it might occur on the 16th throw so the die might not be biased. The answer could be that the die is not biased but on the evidence given here it seems to be biased.

**16. (a)** $180 - 90 - 25 = 65°$

**(b)** $\cos 25° = \dfrac{|AC|}{|BC|} = \dfrac{20}{|BC|}$

**(c)** $|BC| \cos 25° = 20$

$|BC| = \dfrac{20}{\cos 25}$

$|BC| = 22$ metres

Calculator: cos 2 5 = . 0·9063
$20 \div 0{\cdot}9063 = 22{\cdot}068$

**(d)** We could use Pythagoras's Theorem.

$|BC|^2 = |AB|^2 + |AC|^2$

**(e)** $(22)^2 = (20)^2 + (AB)^2$

$484 - 400 = (AB)^2$

$\sqrt{84} = |AB|$

$9 \text{ m} = |AB|$