

# Grade D PROMPT sheet

## D1 Equivalent fractions, decimals & percentages

- Percentage to decimal to fraction

$$27\% = 0.27 = \frac{27}{100}$$

$$7\% = 0.07 = \frac{7}{100}$$

$$70\% = 0.7 = \frac{70}{100} = \frac{7}{10}$$

- Decimal to percentage to fraction

$$0.3 = 30\% = \frac{3}{10}$$

$$0.03 = 3\% = \frac{3}{100}$$

$$0.39 = 39\% = \frac{39}{100}$$

- Fraction to decimal to percentage

$$\frac{4}{5} = \frac{80}{100} = 80\% = 0.8$$



Change to 100

$$\frac{3}{8} = 3 \div 8 = 0.375 = 37.5\%$$

## D2 Increase/Decrease by a percentage

- To increase £12 by 5%

$$= 1.05 \times \text{£}12 \quad (100\% + 5\% = 105\%)$$

OR

$$= \text{£}12 + 5\% \text{ of } \text{£}12$$

- To decrease £50 by 15%

$$= 0.85 \times \text{£}50 \quad (100\% - 15\% = 85\%)$$

OR

$$= \text{£}50 - 15\% \text{ of } \text{£}50$$

## D3 Divide a quantity into a given ratio

~ Put headings

~ Find how many shares in total

~ Amount  $\div$  no. shares = value of one share

e.g. Divide £240 between A and B in ratio of 3:5

A : B

3 : 5 = 8 shares

One share = £240  $\div$  8 = £30

A = 3 shares = 3  $\times$  £30 = £90

B = 5 shares = 5  $\times$  £30 = £150

## D4 Use proportional reasoning

- Change an amount in proportion

e.g. If 6 books cost £22.50

Find the cost of 11. (*find cost of 1 first*)

- Change amounts to compare

e.g. A pack of 5 pens cost £6.10

A pack of 8 pens cost £9.20

Which is the best buy? (*find cost of 40 of each or 1 of each*)

## D5 Calculate with fractions

- Add & subtract fractions

~ Make the denominators the same

|                                   |                                   |
|-----------------------------------|-----------------------------------|
| e.g. $\frac{1}{5} + \frac{7}{10}$ | $\frac{4}{5} - \frac{2}{3}$       |
| $= \frac{2}{10} + \frac{7}{10}$   | $= \frac{12}{15} - \frac{10}{15}$ |
| $= \frac{9}{10}$                  | $= \frac{2}{15}$                  |

- Multiply fractions

~ Write 7 as  $\frac{7}{1}$

~ Multiply numerators & denominators

|                                    |                                  |
|------------------------------------|----------------------------------|
| e.g. $5 \times \frac{2}{3}$        | $\frac{4}{5} \times \frac{2}{3}$ |
| $= \frac{5}{1} \times \frac{2}{3}$ | $= \frac{8}{15}$                 |
| $= \frac{10}{3} = 3\frac{1}{3}$    |                                  |

- **Divide fractions**

~Write 7 as  $\frac{7}{1}$

~Flip numerator & denominator after ÷

~Multiply numerators & denominators

|                                    |  |
|------------------------------------|--|
| e.g. $5 \div \frac{2}{3}$          | $\frac{4}{5} \div \frac{2}{3}$                   |
| $= \frac{5}{1} \times \frac{3}{2}$ | $= \frac{4}{5} \times \frac{3}{2}$               |
| $= \frac{15}{2} = 7\frac{1}{2}$    | $= \frac{12}{10} = 1\frac{2}{10} = 1\frac{1}{5}$ |

- **Calculate fraction of quantity**

To find  $\frac{4}{5}$  of a quantity  $\rightarrow \div 5 \times 4$

e.g.  $\frac{4}{5}$  of £20 =  $20 \div 5 \times 4 = \text{£}16$

### D6 Solve an equation by trial & improvement method

~ Find 2 consecutive numbers that the solution lies between

~ Then choose the half way number

~ Keep making improvements until the required accuracy achieved

e.g. To solve  $x^3 - 3x = 6$  (correct to 1dp)

| Try x = | $x^3 - 3x$                       | Comment   |
|---------|----------------------------------|-----------|
| 2       | $2^3 - 3 \times 2 = 4$           | Too small |
| 3       | $3^3 - 3 \times 3 = 28$          | Too big   |
| 2.5     | $2.5^3 - 3 \times 2.5 = 8.125$   | Too big   |
| 2.3     | $2.3^3 - 3 \times 2.3 = 5.267$   | Too small |
| 2.4     | $2.4^3 - 3 \times 2.4 = 6.624$   | Too big   |
| 2.35    | $2.35^3 - 3 \times 2.35 = 5.928$ | Too small |

Solution is nearer 2.4 than 2.3

So  $x = 2.4$  (correct to 1dp)

### D7 Solve linear equations

~Multiply out brackets first

~If there are letters on both sides get rid of the smaller first

~Do the same to both sides

e.g.

To solve  $5(x - 3) = 3x + 7$  (expand bracket)

$$5x - 15 = 3x + 7 \quad (-3x \text{ from both sides})$$

$$2x - 15 = +7 \quad (+15 \text{ to each side})$$

$$\frac{2x}{2} = \frac{22}{2} \quad (\div 2 \text{ both sides})$$

$$x = 11$$

### D8 Sequences

- **Understand position and term**

|          |   |   |    |    |
|----------|---|---|----|----|
| Position | 1 | 2 | 3  | 4  |
| Term     | 3 | 7 | 11 | 15 |



+4

Term to term rule = +4

Position to term rule is  $n \times 4 - 1$

(because position 1  $\times 4 - 1 = 3$ )

nth term =  $n \times 4 - 1 = 4n - 1$

- **Generate terms of a sequence**

If the nth term is  $5n + 1$

$$1^{\text{st}} \text{ term } (n=1) = 5 \times 1 + 1 = 6$$

$$2^{\text{nd}} \text{ term } (n=2) = 5 \times 2 + 1 = 11$$

$$3^{\text{rd}} \text{ term } (n=3) = 5 \times 3 + 1 = 16$$

### D9 Plot graphs of linear equations

~Substitute values of x into the equation

~Plot the points in pencil

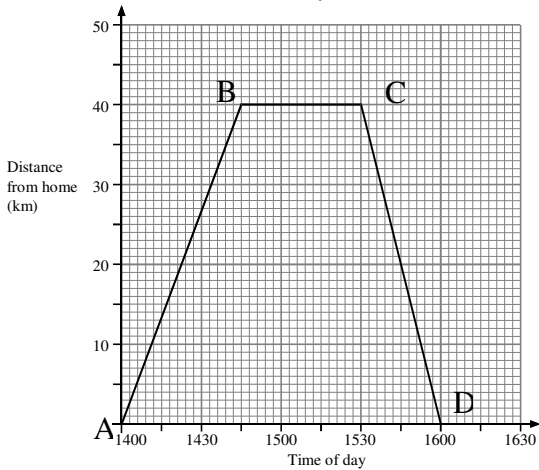
~Join the points with a ruler and pencil

~They should be in a straight line

e.g.  $y = 3x - 1$

|   |    |    |    |   |   |
|---|----|----|----|---|---|
| x | -2 | -1 | 0  | 1 | 2 |
| y | -7 | -4 | -1 | 2 | 5 |

## D10&11 Real life graphs Some examples



- AB shows the journey away
- BC shows no movement
- CD shows journey back
- The steeper the line the higher the speed

## Matching graphs to statements



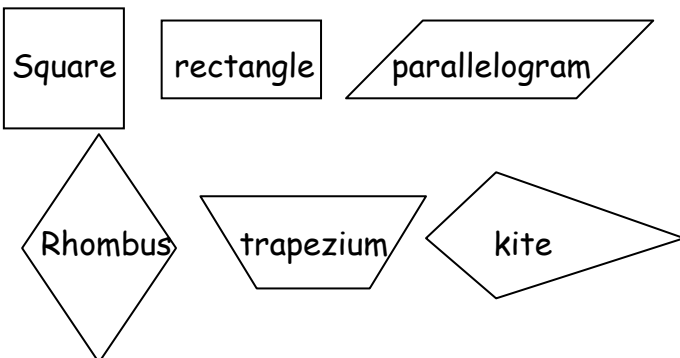
|   |  |
|---|--|
| The price of oil, which was rising steadily at the beginning of the year, is now beginning to fall. |  |
| Unemployment has been falling steadily over the last year.  |  |
| The birth rate was falling rapidly but is now steady.   |  |
| House prices, which were rising slowly, are now starting to rise rapidly.                           |  |



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## D12 Quadrilaterals & their properties



- Know the name of each quadrilateral
- Does it have line and/or rotational symmetry?
- Are the diagonals equal or bisect each other?
- Does it have parallel sides?
- Are angles equal or opposites equal?
- Are the sides equal or opposites equal?

## D13&14&15 Angles

### • Angles & parallel lines

|   |   |  |
|---|---|--|
|   |   |  |
| F-shape<br>Corresponding<br>angles<br>are equal | Z-shape<br>Alternate<br>angles<br>are equal | C or U shape<br>Interior<br>add up to 180° |

### • Angles and straight lines

|                      |                           |
|----------------------|---------------------------|
|                      |                           |
| Straight line = 180° | Opposite angles are equal |

### • Angles of polygons

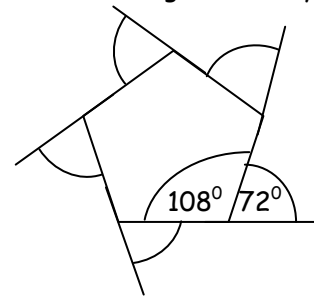
~Polygons have straight sides

~Polygons are named by the number sides

- 3 sides - triangle
- 4 sides - quadrilateral
- 5 sides - pentagon
- 6 sides - hexagon
- 7 sides - heptagon
- 8 sides - octagon
- 9 sides - nonagon
- 10 sides - decagon

~With ALL sides equal they are called REGULAR

~ Sum of exterior angles is always 360°



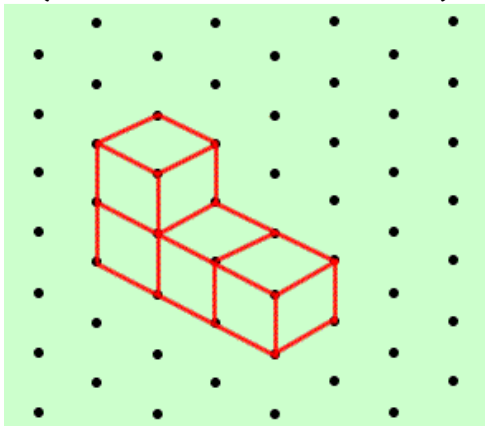
~ the interior & exterior angle add up to 180°

~ the interior angles add up to:

- Triangle =  $1 \times 180^\circ = 180^\circ$
- Quadrilateral =  $2 \times 180^\circ = 360^\circ$
- Pentagon =  $3 \times 180^\circ = 540^\circ$
- Hexagon =  $4 \times 180^\circ = 720^\circ$  etc

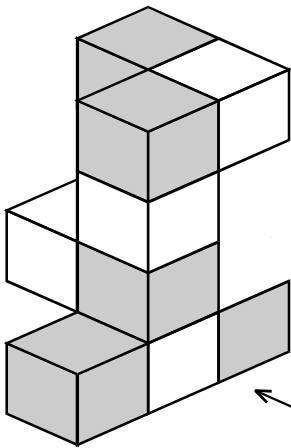
## D16 2D representations of 3D shapes

- **3D drawing on isometric paper**  
(notice NO horizontal lines)



- **3 views of a 3D shape**

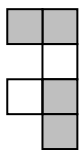
Plan view



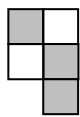
side-view

front elevation

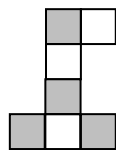
Side view



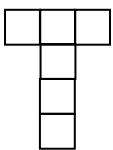
Plan view



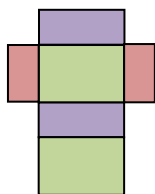
Front elevation



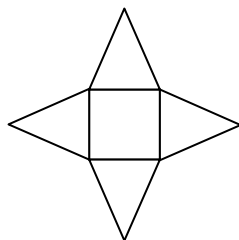
- **Nets**



Cube



Cuboid

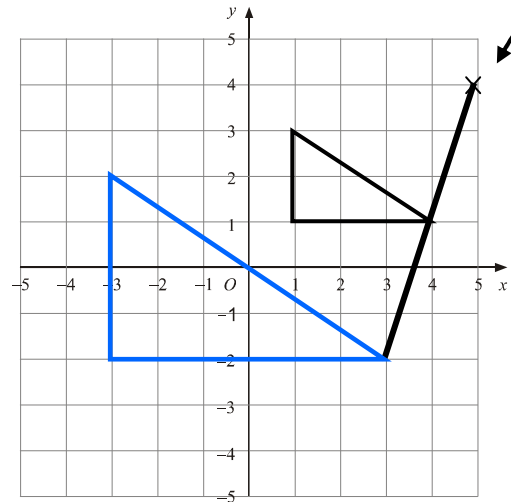


Square based pyramid

## D17 Enlarge a shape

You need to know:

- Centre e.g. (5, 4)
- Scale factor e.g. 2



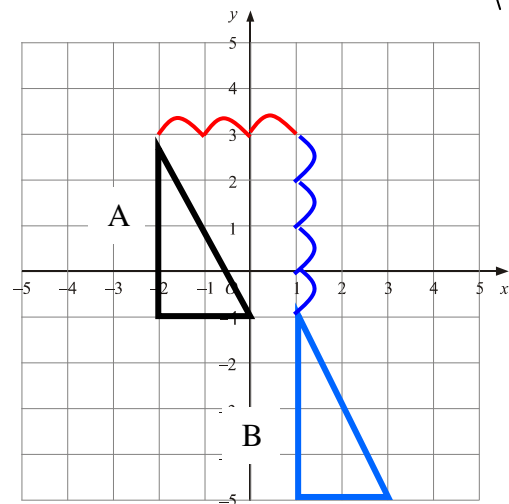
## D18 Translate, rotate & reflect a shape

USE TRACING PAPER TO HELP

- **Translate a shape**

You need to know:

- Vector from A to B e.g.  $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$  Right Down



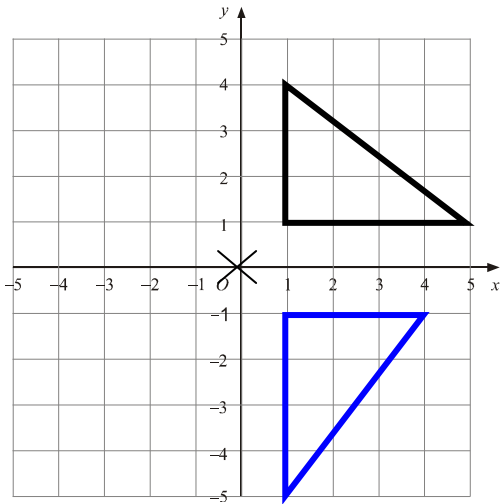
Notice:

- The new shape stays the same way up
- The new shape is the same size

- **Rotate a shape**

You need to know:

- Angle e.g.  $90^\circ$
- Direction e.g. clockwise
- Centre of rotation e.g.  $(0,0)$



- **Reflect a shape in a line**

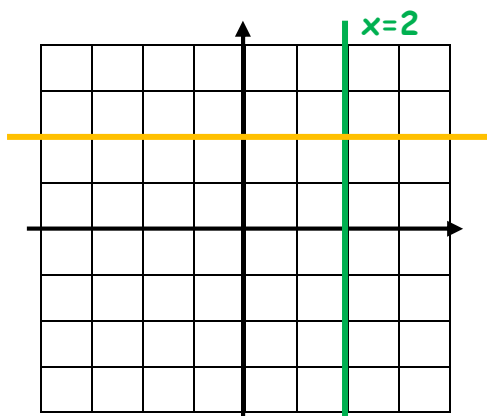
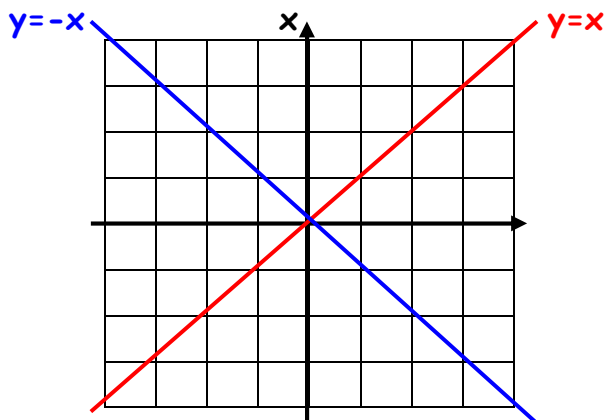
The line could be vertical, horizontal or diagonal

On a grid:

The vertical line would be called  $x = ?$

The horizontal line would be called  $y = ?$

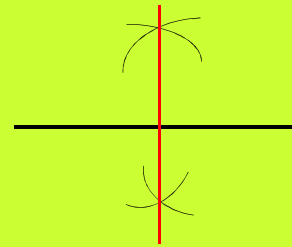
The diagonal line would be called  $y = x$  or  $y = -x$



## D19 Constructions

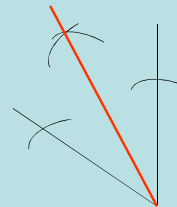
- **Perpendicular bisector of a line**

Draw a straight line through where the arcs cross above and below.



- **Bisector of an angle**

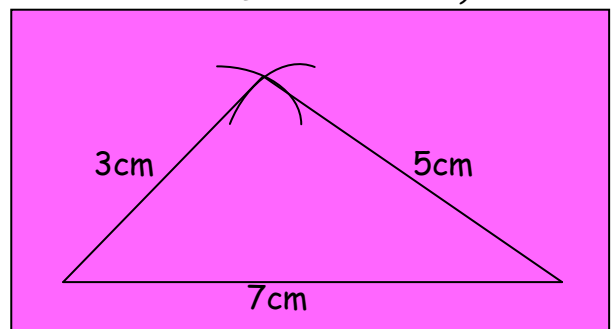
Draw a line from where the arcs cross to the vertex of the angle



- **Construct triangle given 3 sides**

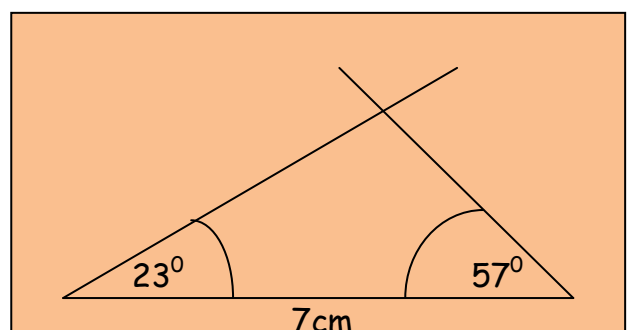
*(Use a pair of compasses)*

*Leave the arcs on*



- **Construct triangle given angles**

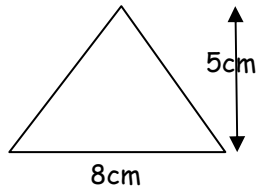
*(Use a protractor)*



## D20 Use formulae for area & volume

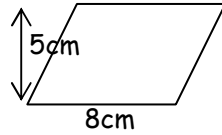
- **Area of triangle**

$$\begin{aligned} \text{Area of triangle} &= \frac{b \times h}{2} \\ &= \frac{8 \times 5}{2} \\ &= \underline{20\text{cm}^2} \end{aligned}$$



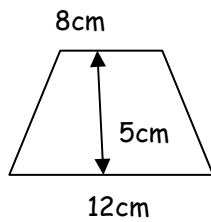
- **Area of parallelogram**

$$\begin{aligned} \text{Area of parallelogram} &= b \times h \\ &= 8 \times 5 \\ &= \underline{40\text{cm}^2} \end{aligned}$$



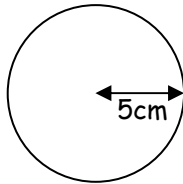
- **Area of trapezium**

$$\begin{aligned} \text{Area of trapezium} &= \frac{(a + b) \times h}{2} \\ &= \frac{(8 + 12) \times 6}{2} \\ &= \underline{60\text{cm}^2} \end{aligned}$$



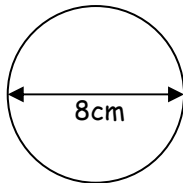
- **Area of circle**

$$\begin{aligned} \text{Area of circle} &= \pi \times r^2 \\ &= \pi \times 5^2 \\ &= \underline{78.5\text{cm}^2} \end{aligned}$$



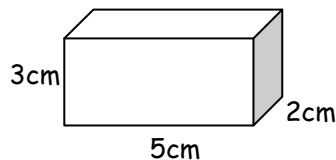
- **Circumference of circle**

$$\begin{aligned} \text{Area of circle} &= \pi \times d \\ &= \pi \times 8 \\ &= 25.1\text{cm} \end{aligned}$$



- **Volume of cuboid**

$$\begin{aligned} \text{Volume} &= l \times w \times h \\ &= 5 \times 3 \times 2 \\ &= 30\text{cm}^3 \end{aligned}$$



- **Surface area of cuboid**

$$\left. \begin{aligned} \text{Front} &= 5 \times 3 = 15 \\ \text{Back} &= 5 \times 3 = 15 \\ \text{Top} &= 5 \times 2 = 10 \\ \text{Bottom} &= 5 \times 2 = 10 \\ \text{Side} &= 3 \times 2 = 6 \\ \text{Side} &= 3 \times 2 = 6 \end{aligned} \right\} \text{Total Surface Area} = 62\text{cm}^2$$

## D23 Presentation of data

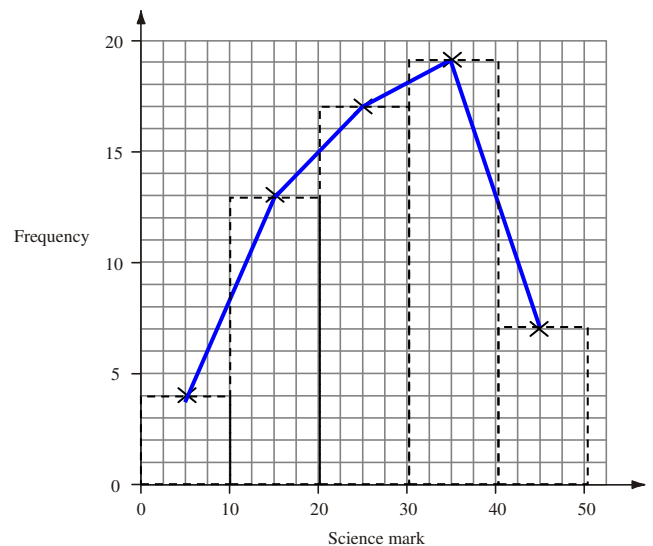
- **Construct a pie chart**

| Transport | Frequency | Angle |
|-----------|-----------|-------|
| Car       | 13 × 9    | 117°  |
| Bus       | 4 × 9     | 36°   |
| Walk      | 15 × 9    | 135   |
| Cycle     | 8 × 9     | 72    |

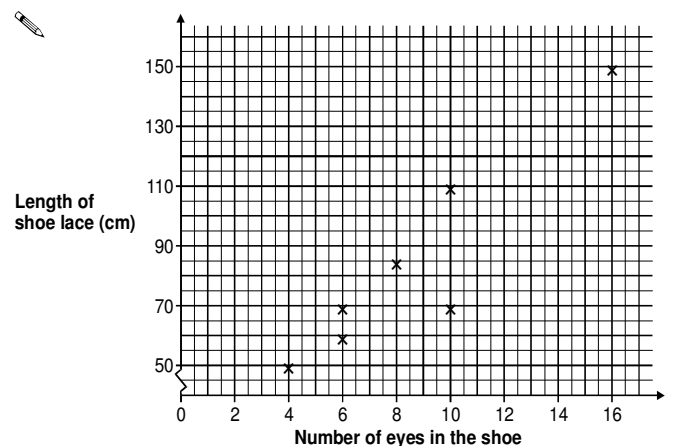
Total frequency = 40

$$360^\circ \div 40 = 9^\circ \text{ per person}$$

- **Construct a frequency polygon**  
(points plotted at the midpoint of the bars)



- **Construct a scatter graph**



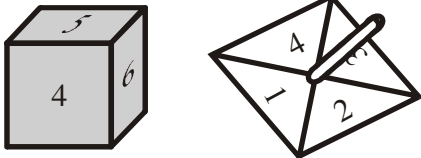
## D24 Find all possible outcomes

Outcomes can be presented:

- In a list
- In a table or sample space

### Example of a sample space

To show all possible outcomes from spinning a spinner and rolling a dice



|         |   | Dice |   |   |   |   |   |   |
|---------|---|------|---|---|---|---|---|---|
|         |   | +    | 1 | 2 | 3 | 4 | 5 | 6 |
| Spinner | 1 | 2    | 3 | 4 | 5 | 6 | 7 |   |
|         | 2 | 3    |   |   |   |   |   |   |
|         | 3 | 4    |   |   |   |   |   |   |
|         | 4 | 5    |   |   |   |   |   |   |

## D25 Sum of mutually exclusive outcomes = 1

- If 2 outcomes cannot occur together, They are mutually exclusive
- If 2 outcomes A and B are mutually exclusive  
 $P(A) + p(B) = 1$
- If 3 outcomes A B and C are mutually exclusive  
 $P(A) + p(B) + p(C) = 1$

e.g. If outcomes A, B and C are mutually exclusive and

$$p(A) = 0.47$$

$$p(B) = 0.31$$

$$p(C) = 1 - (0.47 + 0.31)$$

$$= 1 - 0.78$$

$$= \underline{0.22}$$